

# ANNUAL REPORT

1997 - 98



भारतीय वन्यजीक संस्थान  
Wildlife Institute of India

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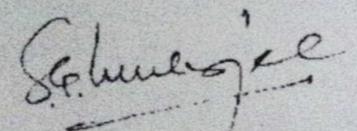
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## DIRECTOR'S NOTE

The fundamental challenge before us is to help create appropriate systems that prompt conservation of biodiversity, human welfare and sustainability of the environment on which life depends. We believe that the best way to meet this challenge of biodiversity conservation and at the same time also understand nature is through conducting short and long term research projects, by working closely with those managing the country's biodiversity amidst various local problems, and by assuring participation of people who have direct stakes in the conservation of biodiversity and sustainability of the habitat.

With the increasing capabilities of the faculty and staff members, suitable changes have been made to the institute's training curricula during the year. The demand on our time by the central Ministry of Environment and Forest and also by the state governments and forest departments, particularly those receiving external funding through the GEF-Ecodevelopment programme, World Bank forestry projects, etc., have been increasing. However, because of our limited manpower resources, we've had to restrict our participation in these to only a few assignments so that we could accomplish these effectively without having to compromise on our training, teaching and research work.

The year, in terms of work and achievements, has been action packed as ever, made possible by the hard work and dedication of the faculty and all staff members.



S.K. Mukherjee

## THE YEAR AT A GLANCE

Well in the second decade of its autonomy, WII continues to move at a good pace - achieving all round satisfactory growth and implementation of its tasks and programmes. The modular format for the Diploma course which was adopted a couple of years ago has been received well, even as we are still trying to shape it further. Based on the feedback and review of the last course conducted in the modular format, it was decided to do some time management and run compatible modules concurrently and provide more time for management plan writing toward the end. And like last year, a special Diploma course was conducted for park managers from Sri Lanka.

Research is one of the major agendas of WII. During the year 1997-98, seven projects were completed and three new ones initiated. Moreover, four of the researchers were awarded their PhD degree during the year. Three of these were in Wildlife Science from Saurashtra University, Rajkot (Gujarat) and one in Economics from Jiwaji University, Gwalior (Madhya Pradesh).

The advance research programme as part of the second phase collaboration with US-FWS and USFS is progressing satisfactorily and we are almost midway through the project period. In September 1997, during the celebration of its 20th year of association with scientific organizations in India in the field of wildlife conservation, FWS recognized the role played by WII and conferred citation at Washington.

WII has been assigned important tasks by the Ministry of Environment and Forest under the India Ecodevelopment Programme of GEF. These were duly completed, with the exception of Palamau and Nagarhole national parks which could not be taken up for reasons beyond our control. Consultancy was provided to the Maharashtra, Madhya Pradesh and West Bengal state forest departments on various aspects of wildlife conservation and management.

A major collaborative project, with UNDP, which sought to train field officers in Management Planning and Ecodevelopment Planning in protected areas was completed this year. Besides, conducting two training courses each under the two subject heads, eight management plans and nine ecodevelopment plans were completed for selected sites all over the country with the help of the concerned states. For the implementation of these Plans, a sub programme support document on PA management was formulated and presented before the representatives of the Govt of India, the concerned State governments, FAO/UNDP and other donor agencies.

During the year, WII was designated the country's 23rd ENVIS centre of the Ministry of Environment and Forest in September 1997. The special subject category for WII's ENVIS centre is Wildlife and Protected Areas. As part of its information dissemination objective, the first of the bi-annual bulletin was published this year.

On the infrastructural front, the computer section has enhanced its hardware and software capacities, besides further additions to the LAN. The library has been fully computerized thus making it user-friendly. The laboratory has conducted successful investigations into criminal cases related to wildlife products. The AV unit has developed its personnel capabilities and is now beginning to make short films in-house.

All in all, the year 1997-98 has been progressive and satisfactory.

## MAIN WORK PROGRAMME:1997-98

### REGULAR TRAINING COURSES

- \* XVIII PG Diploma Course in Wildlife Management (September 1996 - May 1997)
- \* XIX PG Diploma Course in Wildlife Management (September 1997 - May 1998)
- \* Ecodevelopment for Biodiversity Conservation (Module in XVIII Diploma Course, April-May 1997)
- \* Vth M.Sc. (Wildlife) Course (ended in July 1997)
- \* VI M. Sc. (Wildlife) Course (started in July 1997)
- \* XIII Certificate Course (May-July 1997)

### SHORT COURSES

One-week Capsule Course in Wildlife Management for IFS officers (September 1996)

- \* Wildlife Protection, Law and Forensic Science (13-24 October 1997)
- \* Endangered Species and Zoo Management Course (February 1998)

### WORKSHOPS

- \* Interpretation & Conservation Education
- \* Short term training programme for customs, coastguards, BSF, ITBP, Police Intelligence & Traffic India personnel
- \* Wildlife Tourism Management
- \* Biodiversity Conservation for Sustainable Development
- \* GIS

### SEMINARS

- \* Annual Research Seminar
- \* Training Seminar on Wetland Conservation



People's Institution: 'Devta' at Lapha

B.M.S. Rathore

## BACKGROUND

In the last half a century, India's rich biodiversity, its once bountiful range of habitat types and the species richness therein have become highly eroded and fragmented. This has come about largely as a result of rapid human and livestock population increase and through following a rather disproportionate distributive development pattern which have marginalized or unjustly exploited the country's rich wilderness areas. This is cause for considerable concern.

Since wilderness area protection still remains among the most effective ways of conserving the country's biodiversity, there is a sense of introspection among all concerned on how to check and reverse the loss. Among others, the forest departments who are the guardians of the forests in the country, have realized that the forests are not merely an industrial raw material but a vital cog in the ecological wheel which determines the humanity's ultimate and sustained well being. Such realization is a positive step towards recovery.

At such a critical moment, it became essential to have an organization that would guide this agenda for recovery through a holistic look at the forests and combine their management with conserving their biodiversity and also protecting the interests of the people living in their vicinity in a manner that would be practical and scientifically valid. This led to the setting up of the Wildlife Institute of India (WII) at Dehra Dun in 1982 with a mandate to train government and non-government personnel, carry out research and advise on matters of wildlife management and

conservation in accordance with the realities in the field. What was particularly challenging for WII was the fact that forest education hitherto made only passing references to wildlife, and wildlife science was not an established subject in the country's university education curriculum. This meant that WII has to not only give forest education a wildlife bias, but also create and develop the very resources with which to go about this task.

This initial disadvantage actually turned out to be WII's strength, because it meant building a strong foundation unencumbered with past prejudices, and this prevented its programmes from becoming mere academic exercise. The research, being conducted at sites across the length and breadth of the country, enables constant reviewing and updating of the teaching and training programmes, and helps seek an integration of biological, socio-economic and human aspects in large, regional landscapes.

Working through bilateral cooperation and collaborations at national and international levels, WII has today built a strong institutional infrastructure and scientific temper, that boast a trained and skilful faculty and state-of-art technologies. With many countries in the south and south-east Asia region regularly sending their personnel to train here, WII is already considered an important regional centre for training and education in wildlife management and conservation.

## WII'S OBJECTIVES

- \* Train managers and biologists for protected area management and wildlife research;
- \* Train education and extension specialists for protected areas so as to get public support for wildlife conservation;
- \* Provide orientation courses for those involved in landuse management;
- \* Conduct and coordinate applied wildlife research and evolve relevant techniques suited to Indian conditions;
- \* Create a database for building up a wildlife information system employing modern computerized analytical techniques; and
- \* Provide advisory and consultancy services to central and state governments, universities, research institutions and other official and non-official agencies.



*Jurinea macrocephala*, commonly known as "Dhoop". The plant is heavily extracted from Great Himalayan National Park for making incense.

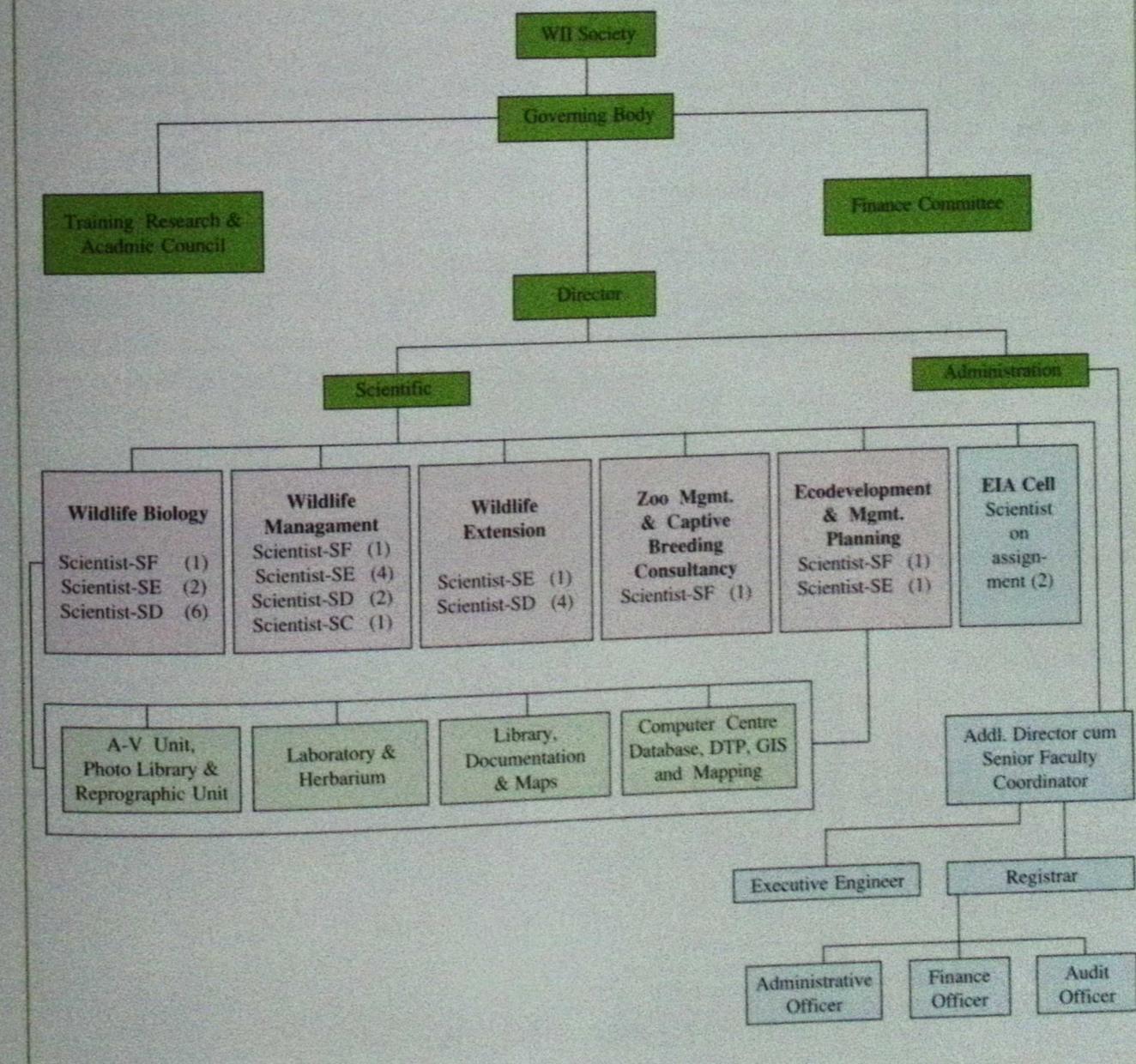
Sanjay K. Singh

## INSTITUTIONAL INFRASTRUCTURE

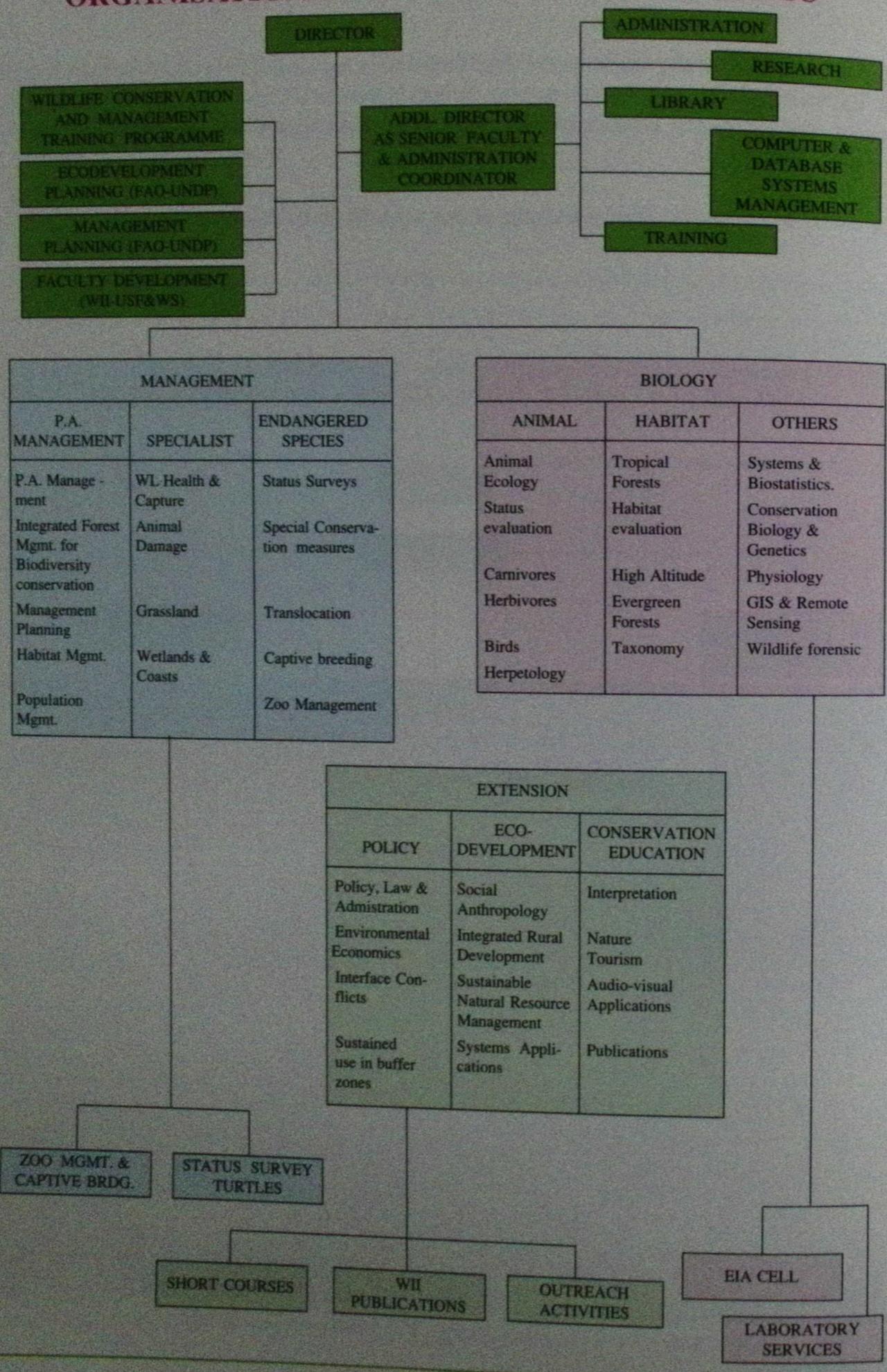
There are three faculty divisions at WII - Wildlife Biology, Wildlife Management and Wildlife Extension, besides two units, namely Ecodevelopment Cell and the EIA Cell. Providing support are Library and Documentation Centre, Computer Centre, Laboratory, Herbarium and an Audio-Visual Unit.

The charts below depict WII's institutional and scientific infrastructure.

### ORGANIZATIONAL STRUCTURE - ADMINISTRATIVE



## ORGANISATIONAL STRUCTURE - SCIENTIFIC



## ACADEMIC

### TRAINING PROGRAMMES

#### Post-Graduate Diploma Course in Wildlife Management

The XVIII Post-graduate Diploma Course, which started on 1 September 1996 was the second course to be organized under the new modular system. It successfully concluded on 30 May 1997. The course participants included 14 forest officers from the various states and union territories in the country, one veterinary officer from CCU, Haryana Agricultural University, Hissar and five foreign nationals. Arindan Tomar (Rajasthan) received the institute's Gold Medal for standing first in the order of merit. The Director's award for the second best trainee went to Asit Gopal (Madhya Pradesh). The Best Allround Wildlifer prize was given to Sunil Kumar (Bihar). The Wildlife Preservation Society's Medal was awarded to Arindan Tomar (Rajasthan), who also got the NR Nair Memorial Medal for the best management plan, besides top trainee book prizes on ecology and behaviour, and wildlife management.

The XIX Diploma course commenced from

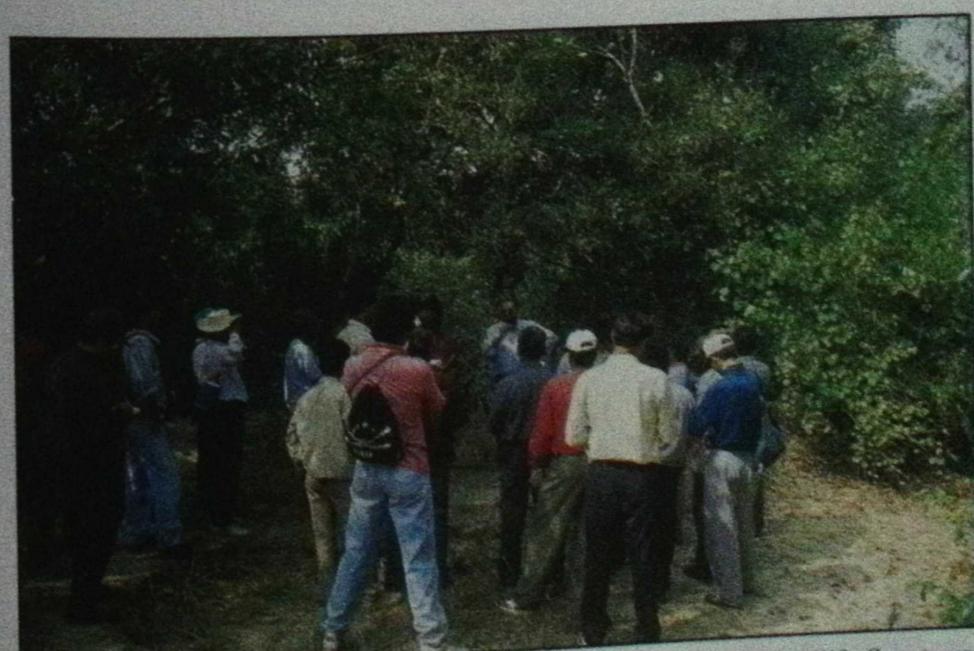
1 September 1997 in which 14 forest officers from different states/UT within the country and nine foreign nationals (five from Sri Lanka, sponsored by FAO; two from Vietnam and one from Myanmar, sponsored by the Global Tiger Forum; and one officer from Nepal under the SAARC fellowship) are undergoing training.

The *Orientation tour* was conducted at Sariska tiger reserve (Rajasthan); the *Techniques tour* in Rajaji national park (Uttar Pradesh); the *Wildlife Health tour* at IVRI Regional Centre, Mukteshwar (Uttar Pradesh); and the *Management tour* across selected protected areas in Orissa and Madhya Pradesh. The Management term paper exercise was conducted in Jaldapara wildlife sanctuary and Buxa tiger reserve in West Bengal.

At the time of writing this report, a month-long (starting 10 March 1998) module on Ecodevelopment was on which, apart from the regular trainees, was being attended by four lateral entrants.

#### Special Diploma Course in Wildlife Conservation and Management

This was second such course organized exclusively for the officers of the Department of Wildlife Conservation, Sri Lanka. The course, like the first course, was divided into two parts. However, unlike the earlier one, WII's role this time was limited to training the participants only in India, over a period of three months from November 1997 to February 1998. There



Officers of the XIX Diploma Course on a visit to Bhitarkanika Wildlife Sanctuary  
Ajai Saxena

were 16 officer trainees who participated in the course. The participants were accompanied by two former alumni of WII from Sri Lanka who helped interpret and facilitate learning. The trainees were taken to important elephant habitats in West Bengal, Kerala and Tamil Nadu, besides the World Heritage site - Keoladeo Ghana national park at Bharatpur (Rajasthan). Another feature of the training in India was the individual field assignments for the trainees in Kanha tiger reserve, Madhya Pradesh.

#### Certificate Course in Wildlife Management

The XIII Certificate Course in Wildlife Management for in-service Forest Range Officers and others of equivalent rank started on 1 May 1997. In all, there were 29 course participants representing nine states/UT including eight participants from the overseas (three from Vietnam, sponsored by the Global Tiger Forum; two from Bangladesh, sponsored by US-FWS and three from Malaysia, sponsored by UNESCO).

With stress on the practical aspects of wildlife management, much time was devoted to practical work, both on the campus and in the field. The *Orientation - cum - techniques tour* was conducted at Rajaji national park (Uttar Pradesh) wherein the trainees were introduced to field techniques in monitoring wildlife and measuring habitat. Field exercises in habitat description, mapping and evaluation, census operations and PRA were also conducted.

The *Management tour* included Dudhwa national park, Kishanpur wildlife sanctuary, Kukrail crocodile park (all Uttar Pradesh), Kanha national park and Phen wildlife sanctuary (Madhya Pradesh). The participants studied and evaluated the management practices at these places.

The performance of the trainees was assessed through examinations and practical evaluation based on the field projects. The course concluded on 31 July 1997. The *Wildlife Conservation Silver Medal* for the Top trainee went to KC Lamzuala from Mizoram, who also bagged the WII prize for

the Best Practical Wildlifer and WII Prize for Wildlife Management.

#### SHORT COURSES

##### Capsule course in Wildlife Management

8-12 September 1997

Sponsored by the Ministry of Environment and Forest, Government of India, this one-week course is designed for forest officers who have not had any formal training in wildlife management. The course orients the participants to wildlife and its conservation and provides them an understanding of the basics of wildlife science, critical management issues, park-people interface and biodiversity conservation outside PAs, so that they can contribute effectively towards conservation of wildlife resources. Two new additions to the course syllabus were a session on "Wildlife forensic science" and panel discussion on "Improvement in the working of the forest departments and need for career development through training and improvement in skills".

Eleven officers from seven different states participated in the course which was spread over 20 classroom teaching and practical sessions including a one-day visit to Rajaji national park.

The second such course of three-week duration, which was scheduled to be held in February 1998, could not be conducted due to the country's parliamentary elections held at the time.

##### Wildlife Protection, Law and Forensic Science 13-24 October 1997

This course was organised for Indian Customs and Central Excise Service (ICCES) Group Probationers, 49th Course conducted for the first time, the objective of this course was to sensitise them in enforcement of laws related to control of illegal trade in wildlife and wildlife products. The training programme was specially designed for young officers not familiar with wildlife management in the country and control of illegal trade in wildlife.

It introduced them to the important issues such as CITES, EXIM Policy of GOI and Wildlife (Protection) Act, 1972, and provided them with techniques in basic identification of wild animals/products and wildlife forensic.

In all, 21 probationers attended the course. Training was imparted in the form of classroom lectures, laboratory work and field tours to Rajaji and Dudhwa national parks, including extensive guest inputs through external experts and subject specialists.

##### Endangered species and zoo management course 3-14 February 1998

This was the eighth in the series of courses, conducted by WII and sponsored by the Central Zoo Authority to train alternately senior and middle-level zoo professionals in modern techniques and concepts pertaining to *ex-situ* management of animals especially endangered species. The course this year was for middle-level zoo personnel and was held at the Kanpur Zoological Park (Uttar Pradesh). There were 16 participants from ten State Forest Departments, one from a Veterinary Science University and one from a private zoo. Of these, six were veterinarians. Besides theory lectures, there were field exercises on interviewing visitors, observing

food preparation, storage and distribution procedures, evaluating enclosures and gaining familiarity with the darting equipment. There were group discussions and presentations by participants as well.

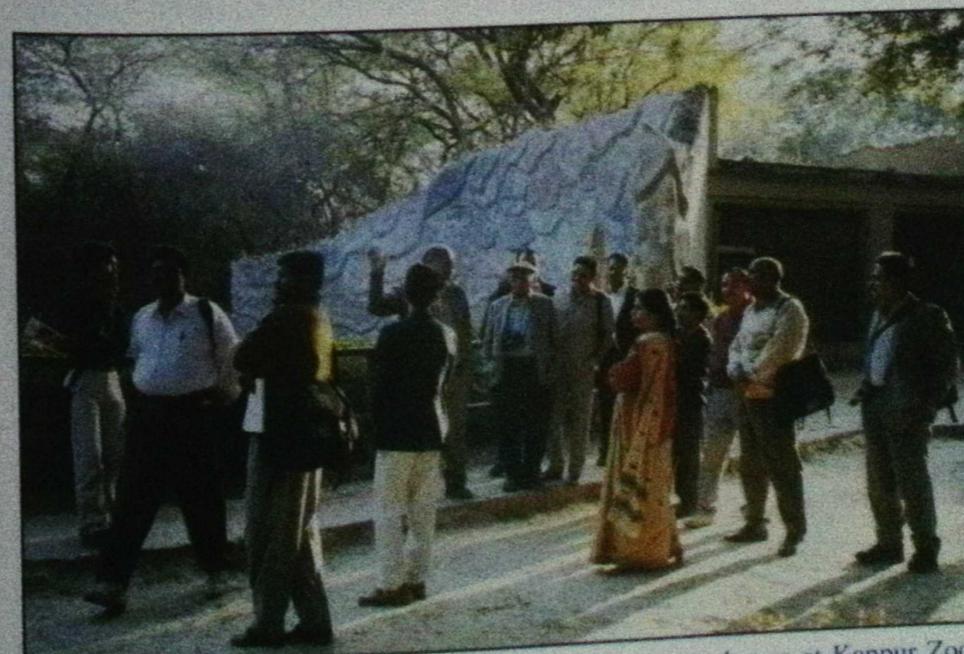
Field trips included visits to the deer enclosure at Nawabganj Bird Sanctuary, Prince of Wales Zoological Gardens, Lucknow and the Endangered Species Breeding Centre at Kukrail (all Uttar Pradesh), the MC Chhattbir Zoo, Chandigarh and the National Zoological Park at Delhi, where the course also had its concluding function.

#### EDUCATION PROGRAMME

##### M.Sc (Wildlife)

For the VI MSc, to begin in July 1997, a national entrance qualifying test was conducted simultaneously at Bangalore, Mumbai, Calcutta and Dehra Dun. From a total of 432 candidates who appeared, 40 were shortlisted for an interview, and eventually nine students were selected. Of these, the top six have been awarded full fellowship from WII, while the seventh has a fellowship from the "Operation Eye of the Tiger" Bainbridge, USA. The remaining two candidates are currently self-sponsored and efforts are underway to secure external sponsors for them.

In the first semester, the students were taken on an *Orientation tour* to Chakrata and Rajaji national park (both Uttar Pradesh) in August and September 1997. In November 1997, a *Techniques tour* was conducted in Sariska tiger reserve and Bharatpur (both Rajasthan). Toward the end of the second semester, at the time of



Participants of Zoo Management Course evaluating an enclosure at Kanpur Zoo.  
B.C. Choudhury

writing this report (March-April 1998), the students are on their *Conservation Practice tour* covering Kanha national park, Achanakmar, Bandhavgarh national park, Panna national park and Chambal wildlife sanctuary in Madhya Pradesh.

## WORKSHOPS, SEMINARS, CONFERENCES AND MEETINGS

### Organized by WII

#### Biodiversity conservation 24-26 June 1997

This workshop on *Management Skills for Biodiversity Conservation* was part of the assignment given to Asian Centre for Organization Research and Development (ACORD) under the GOI-UNDP project. This was a training of the trainers held basically for piloting the module on the subject, besides validating the training material to be used for the institute's training programmes under the project.

#### Conservation education 3-5 July 1997

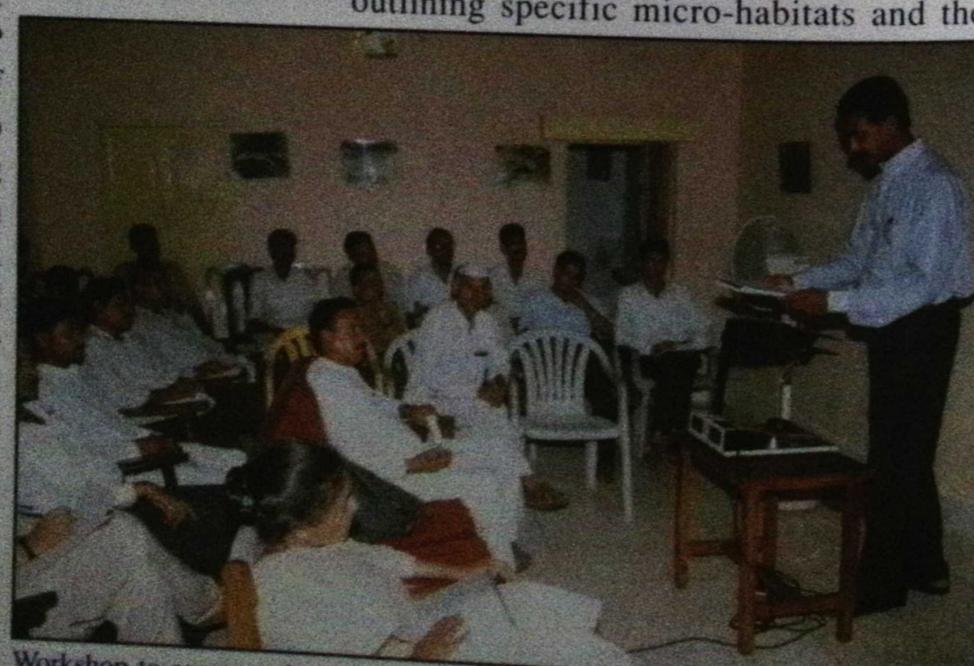
This workshop on *Conservation Education Programme for Rajaji national park and Kanha national park*, held at Chilla, Rajaji national park, was part of the task assigned to the Centre for Environment Education, Ahmedabad, under the ongoing GOI-UNDP project. The objectives of the workshop were to provide an understanding of conservation education and its necessity, including its planning and implementation; and to assess and validate the conservation education strategies for the two areas. There were 33 participants at the workshop comprising the

staff and officials of the two protected areas, representatives from selected local committees and NGOs, and villagers from areas adjoining the Rajaji national park. The deliberations at the workshop will help in evolving the final strategies of conservation education programmes in the two protected areas.

#### Species habitat matrix 23-25 July 1997

As part of the WII-USDA Forest Service collaborative project, a brainstorming workshop was organized at Top Slip, Anamalai (Tamil Nadu) to bring together experienced foresters, biologists, social scientists and NGOs on a common platform. The aim was, generally, to have them discuss issues in biodiversity conservation and, specifically, to create a species-habitat matrix which would allow an assessment of the specific threats to biodiversity in Anamalai Conservation Area, one of the four sites being studied under the collaborative project.

The participants were divided into groups. The biologists shortlisted the top 5% species of high conservation interest from an existing long list, and then drew a species-habitat matrix on the basis of this shortened list. Thereafter, the ecologists produced a matrix outlining specific micro-habitats and the



Workshop to assess and validate the conservation education strategies for Rajaji National Park and Kanha National Park.  
Shambhu Nawani



Workshop on Application of GIS and Remote Sensing in National Resource Management.  
Vinod Verma

threats therein, including specific solutions. The managers and the NGOs worked on the issue of biomass resource use as well as strategies of exploitation aimed at minimising the threats. The outcomes from the different groups were critically examined for their practicality.

#### GIS and remote sensing 5-14 August 1997

A workshop on the *Application of GIS and Remote Sensing in Natural Resource Management* was organised as part of WII's ongoing plans of transfer of technologies to the state forest departments. The workshop, funded by the MP state forest department, was attended by six participants - five sponsored by the Madhya Pradesh Forest Department and one by the Tamil Nadu Forest Department. The workshop introduced the trainees to GIS and Remote Sensing techniques and how these could be useful in better PA management. The participants were provided hands-on in visual interpretation and digitization and exposed to Desktop GIS, habitat characterization using remote sensing and GIS, HTML procedures and Internet.

#### Annual Research Seminar 15-17 September 1997

For WII, its yearly research seminar (ARS) has become a major annual event. The presentations

by research scholars (and sometimes faculty members as well) on the various aspects of their continuing or just completed studies allow an evaluation of their research and draw valuable intellectual and scientific critique. The seminar also provides the budding scientists an exercise in public discourse of their research.

The XI Annual Research Seminar (ARS) had 32 presentations based on 17 research projects and five

MSc dissertation projects. Besides, the ten MSc students from the Vth batch, who were then working as Post Graduate Interns at the institute put up poster presentations on their dissertation.

The ARS was spread over seven sessions chaired by PCCFs, CWLWs and eminent conservationists. The 200 strong audience included 80 guests (PCCFs, CWLWs, other forest department officials, members of WII GB and TRAC, wildlife scientists and conservationists). The presentations were judged by a panel of five judges: Sh JC Daniel, Dr V Gnanaprakasam, Sh Vinod Rishi, Dr Sushil Dutta and Sh SK Mukherjee, and the following were adjudged for the 'top five' awards, given out at every ARS :

- (1) Bivash Pandav - *Preliminary results of tagging studies on olive ridley sea turtles in Orissa;*
- (2) Yogesh Dubey - *Development of a spatial database for wildlife conservation and management in Tadoba-Andhari tiger reserve;*
- (3) A Christy Williams - *Elephant food plants in Rajaji national park : A modelling approach to predict future trends;*
- (4) Sonali Ghosh - *Ecological impacts of prescribed burning in Corbett tiger reserve;*

(5) Shomita Mukherjee - *Estimation of food habits of small carnivores in Sariska tiger reserve, Rajasthan.*

Every year, each winner is given books worth Rs 750/- . However, this year, there were several others awards as well. Sh Antesh, a researcher in the EIA Cell donated Rs 5000/- towards 'top five' presentations as an award to be known after his father as **Rana Mahesh Singh Award**. With this, each of the five researchers now became entitled to book awards amounting to Rs 1750/-.

The Salim Ali Wild Wings Trust, Mumbai instituted a Rs 2,000/- worth book award for "Best presentation related to the Ecology and Conservation of Birds". This year, the award was given to Prachi Mehta for her presentation *Patterns of distribution of the avifauna along a vertical gradient in logged forests of Melghat tiger reserve, Maharashtra.*

Dr Usha Sharma (Director, Dept of Science and Technology, GOI) donated Rs 1,000/- towards book prizes for Poster presentations, to which WII contributed an equal amount and it was decided to award 'top- three' posters presentations. This year, the winners were : (1) R Suresh Kumar - *Winter habitat use by monal pheasants in Kedarnath wildlife sanctuary* (books Rs 1000); (2) Shalini Pandit - *Pollination ecology of two mangrove plant species in Bhitarkanika wildlife sanctuary* (books Rs 600); and (3) Kashmira Kakati - *Foraging ecology and movement patterns of hoolock gibbons in a forest fragment* (books Rs 400).

#### Wildlife tourism 24 - 26 November 1997

With the objective of developing compatible and sustainable wildlife tourism, a workshop on **Wildlife Tourism and Management in India** was organized. The workshop aimed at bringing together the various interest groups to interact with one another and mutually evolve a strategy which would help create conservation awareness among the public and, at the same time, meets the needs of visitors, PA managers, tourism departments

and private entrepreneurs. There were four participants - three from forest departments and one from tourism department.

The themes and issues covered in the workshop included India's rich natural heritage; current wildlife tourism scenario; impact of tourism on flora, fauna and habitat; visitor carrying capacity; interpretation principles, objectives and methodology; strategies for planning compatible and sustainable wildlife tourism in PAs.

#### Wetland management 24 November - 1 December 1997

Supported by the UNESCO World Heritage Fund, WII conducted a **Regional Training Course on Critical Wetland Habitat Management** at Keoladeo Ghana national park at Bharatpur (Rajasthan) which is a Ramsar and World Heritage site. This course was a result of the Strategic Action Plan for Training Natural Heritage Specialists formulated by UNESCO in 1995 which suggested that UNESCO's World Heritage Centre take steps to ensure that workshops for management practitioners are organized with a view to generating case studies which would become source materials for curricula and training materials development, giving the training a strong field bias.

There were 22 participants in the course, including six from Bangladesh, Nepal, Myanmar, Sri Lanka and Mongolia. The resource persons included faculty members from WII and various other organizations and institutions from around the country. Subjects discussed comprised international conventions and strategies in wetland management; wetland vegetation; focal species management approaches; managing and monitoring wetland habitats; sustainable use of wetland; pollution in wetland; wetland tourism and interpretation; economic evaluation of wetland; hydrological considerations, etc.. Field visits were conducted to the Keoladeo national park, a satellite wetland Bundbarea and Taj Mahal (Agra), another World Heritage site.

#### Workshops, Seminars, Meetings Attended

The Gujarat Institute of Desert Ecology, Bhuj (Kutch) organized a workshop on **Biodiversity : Its Theory, Field Methods and Interpretation** (18-19 April 1997). Dr PK Mathur attended this workshop as a resource person and made a presentation on the *Integrated landuse approaches used for biodiversity conservation and management planning*.

Dr Ruchi Badola (Scientist SD, Ecodevelopment) attended the second international workshop on **Forestry Research in Conservation of Natural Forests**, organized by the Indian Council for Forestry Research and Education (ICFRE), Dehra Dun (25-26 April 1997).

The IUCN Caprinae Specialist Group along with the Gran Paradiso national park and some Universities and Departments involved in research on mountain ungulates in Italy, organized the **2nd World Conference on Mountain Ungulates** at St Vincent-Aosta, Italy (5-7 May 1997). It was attended by representatives from various countries, namely the USA, Canada, France, Norway, Spain, Russia, Austria, Switzerland, Denmark, Saudi Arabia, Nepal, China, Japan, New Zealand and India.

The Indian delegation solely comprised representatives from WII - Dr AJT Johnsingh (Head, Wildlife Biology Faculty), Dr S Sathyakumar (Scientist), Yash Veer Bhatnagar and Nima Manjrekar (both SRFs). Johnsingh had attended the 1st World Conference on Mountain Ungulates in 1989 and has authored the Indian section of the IUCN World Action Plan for Caprinae Conservation. As such, at the present 2nd World Conference, he was invited as a

speaker at a plenary session, where under joint authorship with Charudutt Mishra, a former student of the institute, he presented a paper titled "Conservation status and research of mountain ungulates in India". The other WII representatives also presented papers on the basis of their respective studies on the subject at WII (see "Publications").

The Ministry of Environment and Forests organized a **Review Workshop-cum-Training Programme on Biosphere Reserves** at Joshimath, Uttar Pradesh (11-15 June 1997). The workshop reviewed the on-going research projects under the Ministry's Biosphere Reserve Scheme, and also the Management Action Plan being implemented by the respective State governments. WII was represented at this workshop by Dr Ruchi Badola.

The Bhutan Forest Department and WWF-Bhutan jointly organized an **Integrated Conservation and Development Planning (ICDP) Workshop** (23-26 July 1997). This workshop was part of a larger programme on capacity building in integrated conservation and development planning for the government and NGOs personnel in Asia and the Pacific. The workshop focused on the issues critical to planning a good ICDP Project and the issues covered included - Planning and problems in ICDPs; the planning cycle; significance of conservation, the role of local communities in conservation, their participation and indigenous knowledge; ICDP debates; etc. BMS Rathore (Head, Ecodevelopment) attended the workshop as a resource person.

The National Bureau of Animal Genetic Resources, ICAR, Karnal (Haryana) organized a **Brainstorming**

**Workshop on Livestock Breed Characterization** (August 1997) which was sponsored by the National Bureau of Plant Genetic Resources, New Delhi. From WII, Dr PK Mathur (Scientist SF, Management) attended the workshop as resource person and participated in the deliberations.

MS Rana (Librarian) was one of the five Indians granted a fellowship by DANIDA to attend the **63rd General Conference of International Federation of Library Associations and Institutions-97** at Copenhagen, Denmark (31 August-5 September 1997). The theme of the conference was "Libraries and Information for Human Development". The conference was attended by over 3000 professionals from all over the world.

Dr Ravi Chellam (Scientist SD, Biology) attended the **Cat Specialist Group Meeting** held at Khajuraho (September 1997) which included a field visit to Panna tiger reserve, Madhya Pradesh. He gave presentations on the findings and recommendations of the leopard ecology project conducted under his supervision in Sanjay Gandhi national park, Maharashtra. The Gir lion translocation project was also extensively discussed.

World Pheasant Association - International, IUCN/SSC Pheasant Specialist Group, IUCN/SSC Partridge, Quail and Francolin Specialist Group and Birdlife International organized the **International Symposium on Galliformes**, which was hosted by the Department of Wildlife and national parks, Peninsular Malaysia (8-14 September 1997). The objective was to address the conservation and sustainable management of all species of partridge, quail, francolin, guineafowl and pheasant with special

emphasis on those inhabiting the tropical grasslands and forests of south-east Asia.

The initial sessions were held over three days at Melaka where the emphasis was on poster presentations, which covered wide ranging topics such as national conservation strategies, action plan projects, conservation research efforts, field techniques for tropical forest projects, population and habitat viability analysis, captive management techniques for hot climates, computer software for captive management, use of DNA analysis and case studies on different Galliforme species in Asia. The delegates then travelled to Kuala Tahan, Taman Negara national park for informal workshops on assessing risk of extinction, measuring populations, conservation of green peafowl, habitat analysis and measurement, sustainable management, etc.

From WII, Dr S Sathyakumar who is a member of IUCN/SSC Pheasant Specialist Group attended the symposium and made a poster presentation, entitled "A preliminary model on the ecological relationships between Monal pheasant and Himalayan musk deer".

SK Mukherjee and Dr VB Mathur attended a discussion meet on *DBT-DOS Project for Biodiversity Characterization at Landscape Level using Satellite Remote Sensing* (25-26 September 1997). The meeting was organised by the National Remote Sensing Agency, Hyderabad.

FAO sponsored a workshop on *Forest Resource Assessment : 2000* which was organised by the Forest Survey of India, Dehra Dun (6-8 October 1997). From WII, Dr VB Mathur, Scientist SF (Management) attended the workshop as a resource person on Forest Resource Assessment.

The IUCN/SSC Secretariat at University of Peradeniya and the Otter Research Group, Japan organized a workshop on **Surveying and Monitoring Otter Populations** at Kasetsart University (Bangkok) and Huai Kha Khaeng wildlife sanctuary, Thailand (12-15 November 1997). This was followed by a meeting of the IUCN/SSC Otter Specialist Group - Asian Section. The workshop was attended by 22 participants from 11 Asian countries.

Dr SA Hussain (Scientist), who is the coordinator for the Asian Section, attended the workshop as a resource person. He delivered a talk on the use of radio-telemetry in otter research and followed it up with a practical demonstration of radio-tracking at the Huai Kha Khaeng WLS. He also joined the other resource persons in conducting a survey of otters in the wildlife sanctuary which is one of the prime habitats for three species of otters and other large terrestrial mammals.

At the workshop/meeting it was agreed to start several small projects in the home countries of the participants, which would serve as seed projects to initiate and promote otter conservation in the Asian region.

Conservation and Development Forum, USA, organized **Forum 97 : New Linkages in Conservation and Development** in Istanbul, Turkey (16-21 November 1997). The objective of the conference was to review the experiments in conservation and development over the past decade, highlight the most pressing problems in the field and facilitate the creation of new north-south and south-south partnerships for mutual understanding and effective action. Issues and topics discussed at the plenary session, panel discussion, roundtable and workshops

sessions included - Engaging communities in conservation and development; Culturally conflicting views of conservation; Ethics and responsibility in environmental action; Conservation and development in war and peace; Institutional pathways to sustainability, etc.

The conference was attended by over 200 individuals from universities and research institutions, government agencies, non-governmental organizations, community groups, private foundations and international organizations. From WII, Dr Ruchi Badola (Scientist SD, Edocevelopment) attended the conference and presented a paper titled "Critique of People Oriented Conservation Approaches in India". Her participation was funded by the organizers.

Following the large scale infestation of the sal borer (*Hoplocerambyx spinicornis*) in the Sal forests in Madhya Pradesh this year, the MP forest department organized a workshop on **Sal borer crisis in Madhya Pradesh** at the Kanha national park (30 November - 1 December 1997). From WII, VB Sawarkar (Head, Wildlife Management Faculty) attended the workshop which was called to develop management strategies to deal with the problem within Kanha national park and other protected areas in the state which have been or are likely to be affected. Sawarkar has since been appointed a member of the Steering Committee for the Sal Borer Crisis constituted by the Ministry of Environment and Forests, GOI in January 1998.

The local Army Command organized an **Environment and Nature Conservation Workshop for Army**

Officers, at Rashtriya Indian Military College, Dehra Dun. Dr BK Mishra (Scientist SE, Extension) assisted in the planning and designing the course curriculum and also gave a lecture on "Biodiversity Conservation". At the same workshop, Bitapi C Sinha (Scientist SD, Extension) gave a talk on "The need for creating conservation awareness among para-military personnel".

ESRI-India and NIIT GIS Ltd conducted the 2nd ESRI/ERDAS Users Conference at New Delhi (2-3 December 1997). ESRI are the developers of GIS software ArcInfo, and ERDAS is a software package on digital image processing of remotely sensed data. From WII, Dr VB Mathur, Scientist SF (Management), Rajesh Thapa, Navneet Gupta and Panna Lal (all from GIS/Computer Centre) attended the conference. The best paper award was given to WII for its jointly authored paper "Development of the Protected Areas Atlas of India in Spatial Domain" (see "Publications"). Also, WII was adjudged second in the poster presentation category.

The Kerala Forest Department and School of Social Sciences, MG University, Kottayam organized a workshop on Management Planning in Periyar tiger reserve (11-12 January 1998). The focus of the workshop was on evolving a vision statement and future strategies for tourism management in the Periyar tiger reserve. From WII, AK Bhardwaj, Scientist SE (Ecodevelopment) attended the workshop.

A Guide Training Programme was conducted at Mohali in Naoradehi wildlife sanctuary, Madhya Pradesh (27 January-2 February 1998). The objective of the programme was to

train a small group of local educated youth as tourist guides not only to provide them an employment opportunity, but also to promote wildlife tourism and conservation awareness among the visitors to the wildlife sanctuary. This was a joint endeavour of WII and the Management of Naoradehi wildlife sanctuary. There were 16 participants - matriculate or high secondary pass candidates from the staff and the two adjoining villages of Mohali and Raheli. WII developed the course content and its faculty members Bitapi C Sinha and Pratap Singh (Scientist SE, Extension) provided the basic teaching inputs. The trainees are now working as freelance nature guides.

Considering the rapidly changing scenario, modern biodiversity concepts, all-round uncontrolled development and the importance now being accorded to regional planning, the Field Director of Kanha tiger reserve (Madhya Pradesh) organized a Management Planning Workshop (9-10 February 1998) at Kanha national park to review the tiger reserve's existing management plan. From WII, Dr PK Mathur attended the workshop and gave a presentation focusing on the need to develop a future vision for Kanha tiger reserve involving various stakeholders, and also discussed new approaches relevant to the regional and landscape level planning.

Under the Madhya Pradesh Forestry Project, the MP forest department organized a workshop on Wildlife Management Planning and Ecodevelopment at Kanha national park (9-10 February 1998). While dealing with the planning process at large, the workshop specifically dwelt on Kanha national park, its perceived

values and objectives, the past practices, current issues and research findings, its rich tradition in management, and the managerial regional vision of the future as a framework for revising the management plan for the area. The workshop also sought to develop a framework for the first management plan for the adjoining Phen wildlife sanctuary, which was recently freed of the pressure of cattle grazing and is proposed to be included in the Kanha tiger reserve. VB Sawarkar and Dr PK Mathur attended as resource persons.

The IUCN/SSC Otter Specialist Group, Czech environmental organization ENVI s.r.o. and the German Aktion Fischotter Schutz e.v. organized the VII International Otter Colloquium at Trebon, Czech Republic (14-20 March 1998). The theme of the Colloquium was *Otter conservation - An example for sustainable use of wetland by man*, spread over seven sessions and five workshops.

Dr SA Hussain attended the Colloquium as a resource person and chaired the workshop on *Application of Radio-telemetry in Otter Research* wherein he delivered the keynote address titled "Designing radio-tracking study for otter research : A few considerations" followed by group discussion on the various problems of radio-tracking, field considerations and suggestions to improve the current practices. At a later session, he presented the results of the otter survey conducted by WII in the Terai and lower Himalaya regions of Uttar Pradesh (see "Publications").

A Workshop on Community Participation was conducted by LBS National Academy of Administration,

Mussoorie (Uttar Pradesh). It was mainly attended by people from the Government and non-government organisations from various parts of the country to share their experiences and exchange views on the subject. From WII, AK Bhardwaj attended the workshop.

#### Courses, Training and Study Tours

DVS Khati, Scientist SE (Extension)-attended *National Park and Wildlife Management* training course at University of New England, New South Wales, Australia (23 May-12 July 1997), to develop skills in GIS, environmental economics and ecotourism. The course included visits to various wilderness areas in Australia to understand the concept of ecotourism and its role in the augmentation of local economy. Visits to the Taronga zoo and the Australian Conservation Training Institute, Sydney to study their conservation education programme was also organised. The fellowship for the study tour was provided under the WII-UNDP project.

The US Educational Foundation in India provides professional fellowships under the Fulbright Program. For the year 1997-98, MS Rana, Librarian, was one of the three Indians awardees to get this fellowship to study the various *Information Technologies in Digital Library and Relational Databases* (30 June 1997-15 February 1998). Following a Pre-academic Program at the University of Michigan, Rana completed his six months Academic Program at the School of Information Management System, University of California at Berkeley.

S Wilson and Vinod K Verma, technicians at the Audio-Visual Unit, Extension faculty, underwent a two-week training in *Videography and*

Media Research at the Development Centre of the Technical Teachers Training Institute, Bhopal (Madhya Pradesh) in July 1997. The training syllabus included media language, grammar, portable single camera unit, hands on - "On Camera", editing and familiarization with sound recording equipment. The AV Unit has since produced two short video films - for the institute and one for Indira Gandhi National Forest Academy, Dehra Dun (see *Audio- Visual Unit in section Organization*).

Under the WII-UNDP collaborative project, Sh BMS Rathore, Incharge (Ecodevelopment Cell) and Dr GS Rawat, Scientist SE (Biology) went on a study tour to South Africa, Zimbabwe and Botswana (20 October - 1 November 1997). The study tour was part of the project's faculty development programme and was undertaken with the objective of looking into the role of communities in conservation, management of grasslands, and management of elephants and rhinos.

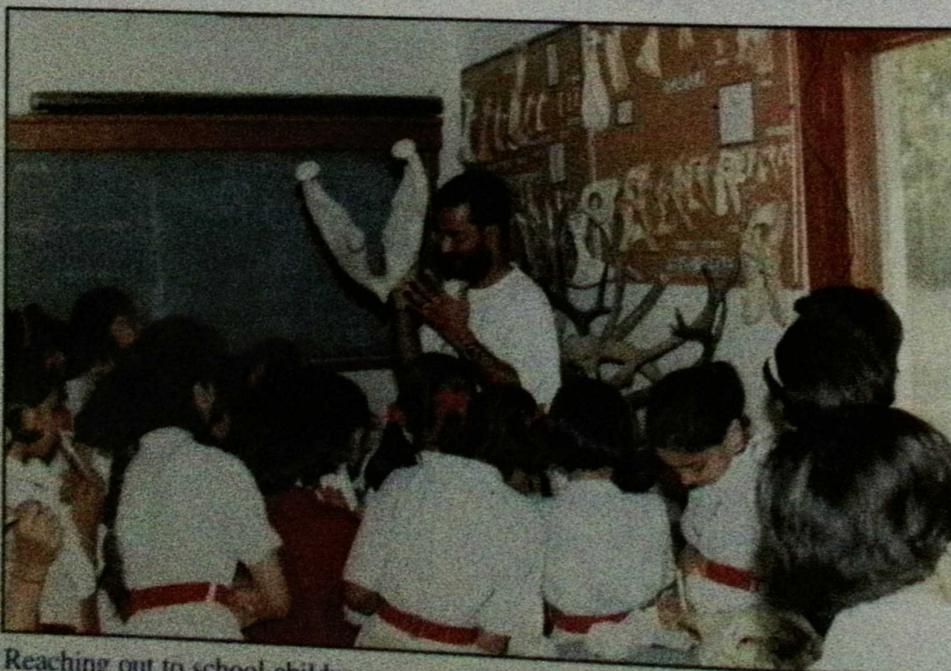
Moreover, five faculty members availed of fellowships during the year for study tours; and two fellowships

and two study tours were availed by the faculty.

The trainee officers of the XVIII diploma course went on field tour to Annapurna Conservation Area in Nepal as part of the ecodevelopment module.

Dr NPS Chauhan (Scientist SD, Management) attended training course *Master Class in Vertebrate Pest Management*, at CSIRO, Australia (20 October - 5th November 1997). The course provided an exposure to the latest principles and technical basis for managing the agricultural and environmental impacts of vertebrate pests. The study tour was organized and funded by the Crawford Fund for International Agricultural Research, CSIRO Wildlife & Ecology, Australian Centre for International Agricultural Research and Vertebrate Biocontrol Cooperative Research Centre, Australia.

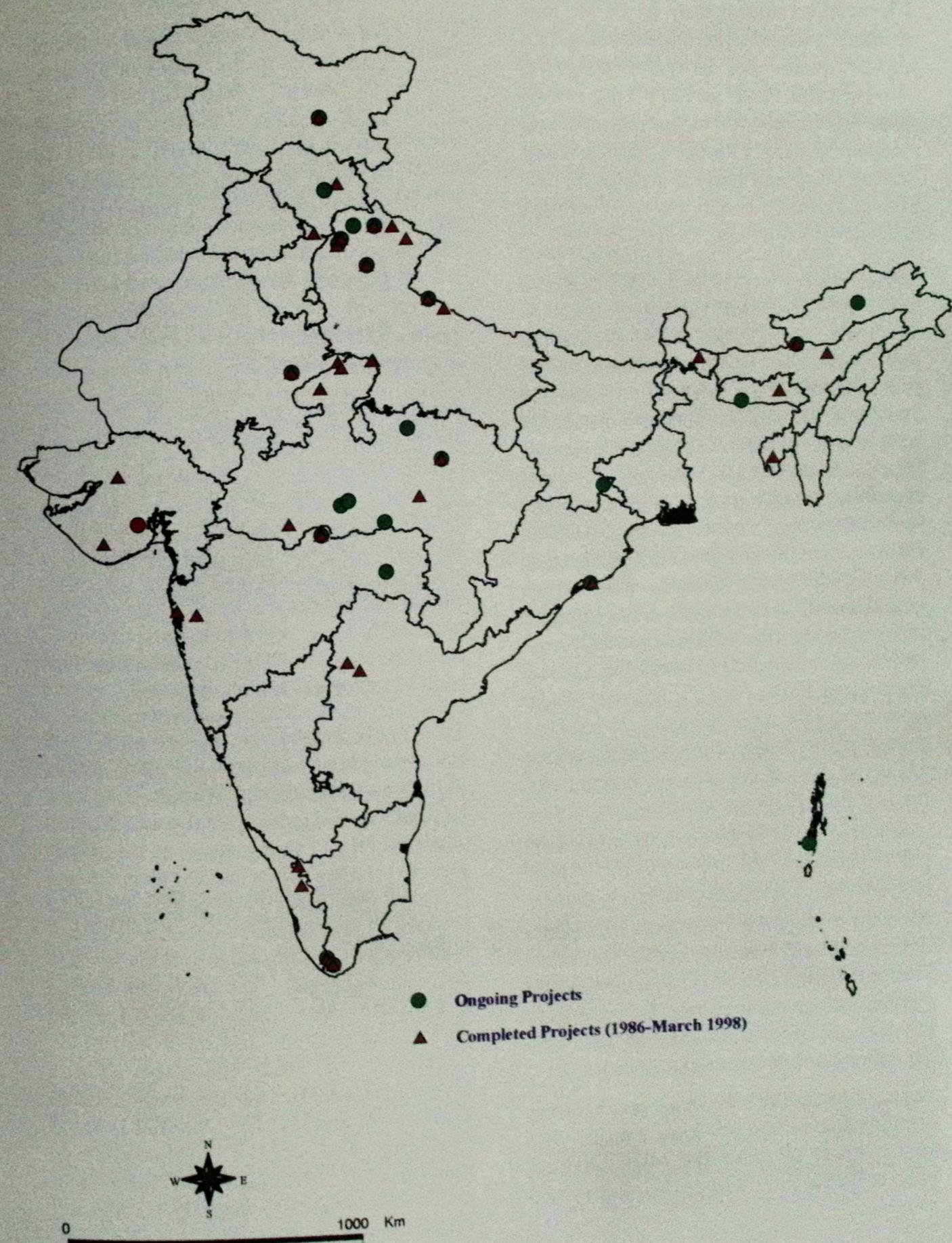
AK Bhardwaj (Scientist SE, Ecodevelopment) attended a training programme in *Participatory Management of Protected Areas* at Regional Community Forestry Training Centre, Kasetsart University, Bangkok (18 February - 6 March 1998).



Reaching out to school children.

Vinod Verma

## Locations of Completed and Ongoing Research Projects



## RESEARCH

Research is an important agenda in WII's mandate, and already it has set high standards, both in terms of generating vital scientific data for better biodiversity conservation and in evolving study methodologies and techniques relevant to the ground conditions in India. Research is also helping build and nurture a cadre of field biologists, socio-economists and wildlife managers.

The gamut of research topics being undertaken at WII covers the ecological, biological, socio-economic and managerial aspects, and the research projects are located in wilderness areas across the length and breadth of the country. These are conducted with ample support of the respective state forest departments and also sister organizations such as Salim Ali Centre for Ornithology and Natural History (SACON), Coimbatore; Indian Institute of Remote Sensing Service Centre, Kharagpur; Department of Ocean Development (Government of India), Goa; National Institute of Immunology, New Delhi; National Zoological Park, New Delhi; and Wadia Institute of Himalayan Geology, Dehra Dun, among others. Some of the research projects are being carried out through international funding and collaboration with organizations, namely US-Fish and Wildlife Service, USDA Forest Service, Ford Foundation, Smithsonian Institution and the World Bank.

All project proposals have to be necessarily scrutinized and whetted by the institute's Training Research and Academic Council (TRAC), which ensures that the objectives of the research projects are in accordance with the national conservation priorities.

During the year 1997-98, seven projects were completed and three new ones initiated. The status report of these and other ongoing projects for the current year is being discussed as under.

## COMPLETED PROJECTS

### \* An ecological study of the montane grasslands in the Valley of Flowers (Western Himalayas) and Eravikulam (Western Ghats) national parks with a view to develop baseline information on grasslands for conservation planning

Faculty : Dr GS Rawat

Researchers : CP Kala and PV Karunakaran

The temperate and tropical montane grasslands of India, located in the mid-ranges of the Himalaya and the hill tops of the Western Ghats occur in different biogeographic zones, have a high level of endemism, yet also have similarities in flora and fauna, and in their high human use value. But lack of adequate scientific data on these grasslands have prevented their effective management and conservation planning. This necessitated their closer evaluation.

This project was started in 1992 and conducted at two representative sites - Valley of Flowers national park (Western Himalaya, UP) and Eravikulam national park (Western Ghats, Kerala). The objectives of the project were to (a) assess plant species diversity and prepare floristic inventories of the grasslands/ meadows; (b) study the community structure, composition, biomass productivity and successional trends; (c) study the forage quantity in different ecological conditions, the animal use patterns and their impact on vegetation; (d) study the effect of tree plantations and fire on the grasslands in Eravikulam; and (e) study the management problems and evolve comprehensive management strategies and long-term conservation of the two areas in particular and the alpine regions in general.

In the Valley of Flowers, a total of 521 species of vascular plants including 499 angiosperms, 4 gymnosperms and 18 pteridophytes were recorded. This was 66 species more than the existing list of plants here, and four species - *Saussurea atkinsonii* Cl., *Duthiea bromoides* Hack, *Lycopodium selago* L and *Salix calyculata* Ht were recorded for the first time in the UP Himalaya. Although there is no quantitative data from past studies to go by, the high density of rare herbs in the national park and their low population outside in the adjacent valleys indicate that protection to the area since its declaration as a national park and the resultant ban on livestock grazing in 1982 has been beneficial on this account. On the other hand, some of the rare species e.g. *Aconitum heterophyllum* reported earlier were not found in this investigation which suggest their extraction and over-exploitation for medicinal use. *Polygonum polystachyum*, a fast growing herb, has been found mainly on freshly eroded slopes, past camping sites, river banks and avalanche tracks both within and outside the park >3800 mts above msl. The areas from where this herb has been eradicated, *Impatiens sulcata*-mixed forb community has taken over.

From the study on livestock grazing in the nearby Khiron valley, it was observed that its effect is species specific. It can be concluded that natural herbaceous formations of alpine regions don't depend on livestock grazing for the maintenance of species diversity, but are rather governed by the various climatic and geomorphological factors.

The study recommends (1) identification and restoration of rare plants and their habitats; (2) species recovery and rehabilitation programme in the outer fringes of the park; (3) monitoring of certain areas dominated by tall and fast growing herbs; (4) aut-ecological research on threatened species; (5) effective implementation of existing Forest Conservation Act and people's participation in the conservation of the area; and (6) development of a nature interpretation centre and guided nature trails in the Valley of Flowers for the management of tourism.

In Eravikulam, comprising grasslands and *sholas* which are unique to the Western Ghats, the study area was stratified into eight landscape units and systematic survey and studies were carried out on various vegetation parameters.

In all, 308 plant species were recorded, adding 106 new species to the earlier list; of which 51 species were endemic to the grasslands and 29 were listed as rare and endangered. Vegetation ordination indicated that clay, pH and sand were important factors which determined species distribution and abundance. The net primary productivity (NPP) values obtained from biomass studies indicated the area to be between tropical and temperate grasslands. In both early and late burnt areas, no significant changes were observed on species diversity, richness and evenness, although these affected the regeneration of *Phlebophyllum kunthianum* and the cover value of dicots in early and late burnt areas showed significant changes in different months. A comparison of the various wattle plantations with unplanted areas showed a decrease in the number of endemic species and food species of the Nilgiri tahr with increase in the age of plantation. The increasing age of plantations also corresponded to an increase in weed abundance.

The study recommends (1) inclusion of the adjacent reserved forests with the *shola*-grasslands in the park; (2) boundary verification and better patrolling to check illegal activities and fire hazards; (3) early burning in selected areas on experimental basis; (4) control of black wattle spreading; (5) long-term monitoring of exclosures and representative *shola*-grassland patches; (6) ecodevelopment measures for Lakkankudi village and (7) better tourism management.

### \* A preliminary study on the ecology of leopard in the Sanjay Gandhi national park, Maharashtra

Faculty : Dr Ravi Chellam

Researcher : Advait Edgaonkar

Of the 36 species of cats extant in the world, 15 are found in India including five of the

large sized cats - tiger, lion, leopard, snow leopard and the clouded leopard. Of these, the leopard is the most widely distributed and is known to occur all over the country except the arid regions of Rajasthan and the higher Himalaya beyond the tree line. Yet, it is listed in the Appendix I of CITES and Schedule I of the Indian Wildlife (Protection) Act, 1972. Habitat destruction, loss of wild prey, poaching for skin, bones and claws, and man-leopard conflicts have made the leopard's existence vulnerable.

Leopard has been known to be adaptable with respect to its habitat and food requirement and can be found in intensively cultivated and inhabited areas as well as in and around urban development. In fact, today many leopards exist outside the protected areas and close to human habitations, giving rise to increasing conflict with man as a result of livestock killing and occasional man-eating.

This preliminary study on the leopard's food habits, activity patterns and the nature of its interaction with man and domestic animals was located at the Sanjay Gandhi national park (Maharashtra), a small island of forest surrounded by very dense human habitation. The park, with low ungulate densities and high levels of resource extraction, disturbance and encroachment, has characteristics typical of many forest areas in India. By documenting the ecology of the leopard in these apparently marginal conditions, it is hoped that the study will supplement the available information on this large carnivore and enable informed management action for its conservation.

The objectives of this short-term study were to (a) determine the diet of the leopard in the national park; (b) estimate the relative abundance of potential prey in selected areas of the park; (c) relate vegetation characteristics, human disturbance and prey abundance to the intensity of habitat use by leopards; and (d) investigate spatial and temporal patterns in the occurrences of man-leopard conflict in and around the park.

Although the leopards here prey upon primates and cervid, their major prey were

found to be domestic dogs, domestic buffaloes and rodents. The paucity of wild ungulates in the park meant the leopards here largely survive on small prey. In the case of buffaloes direct predation is absent, as evidenced from the records of the forest department which has a compensatory scheme for livestock killings; but it is possible that the leopards are scavenging off the buffalo carcasses abandoned near the park's edge by buffalo keepers from the nearby Aarey Milk Colony. The national park being a small high density area for leopards, inevitably forces the next generation growing cubs to stray outside the protected area. This has led to cases of conflicts and even human fatalities, although the number of deaths reported during the period 1988-1996 has not been high. One of the reasons for this could be the prompt management action of capturing and translocating the culprit animals involved in conflicts.

The study recommends, (1) augmentation of the prey base with introduction of wild ungulates from outside; (2) avoiding reintroduction of the captured leopards from human habitations back in the park itself; (3) monitoring for domestic dog transmitted disease; and (4) monitoring for inbreeding depression among leopards.

\* **Nanda Devi Biosphere Reserve : A study on socio-economic aspects for the sustainable development of dependent human populations**

**Faculty : Dr Ruchi Badola**

**Researcher : Dr Chandra Shekhar Silori**

The Nanda Devi region in Chamoli Garhwal (UP) was declared a biosphere reserve in 1998. There were 15 villages located in the buffer zone of the reserve. This study was initiated in 1994 to (a) investigate the socio-economic and cultural status of the people in these villages and to identify the hindrances in the way of accepting ecologically sustainable alternatives; (b) quantify the dependency and biotic pressure of local villagers on the natural resources of buffer

zone of the biosphere reserve and adjoining reserve forests; and (c) suggest strategies for the sustainable utilization of natural resources in the buffer of the biosphere reserve.

The project was completed in 1997. The findings from the study are that (1) over the years the area has undergone vast socio-economic and cultural transformation; (2) the dependency of the local people on the resources of the buffer zone is genuine and resource extraction is for self consumption, except that of mushroom (*Morchella esculenta*) which is done for commercial purposes but is at considerable non-destructive scale; (3) the impact of people's such dependency is largely restricted to the surroundings around the human habitations; (4) the human and livestock dependency on the buffer zone is for not more than six months in the year; and (5) there is need and scope of enhancing the people socio-economic status and developing their stakes in the conservation of the Nanda Devi biosphere reserve through ecodevelopment measures.

On the basis of these findings, it is recommended that efforts require to be made to integrate people's needs and interests with conservation objectives. While working toward the economic upliftment of the people, there is need to provide people with alternatives to their specific dependencies, develop their stakes in the conservation of the biosphere reserve and help set up/strengthen new/existing institutions for sustainable use of the natural resources.

\* **Ecology and genetics of the Himalayan ibex *Capra ibex* in Pin Valley national park, Himachal Pradesh**

**Faculty : Dr AJT Johnsingh, Dr GS Rawat and Dr Michael Stuwe (Smithsonian Institute, USA)**

**Researchers : Dr Yash Veer Bhatnagar and Dr Nima Manjrekar**

Dr Stuwe has studied the Alpine ibex in Switzerland and the Nubian ibex in Israel. It

was at his suggestion that this study on the genetics and ecology of the Himalayan ibex was started. The objective was that, besides comparing the findings here with Stuwe's other two studies, this project would help develop suitable conservation and management guidelines for the high altitude areas in general and the Himalaya in particular. The study was part of the WII-USFWS collaborative projects. It was located in the trans-Himalayan cold desert of Pin Valley national park (Himachal Pradesh), 3600-6632 m above msl, with temperature range -35°C to +35°C.

The study, with extensive data on the ecology of the Himalayan ibex, is now complete.

During 1997-98, Bhatnagar and Manjrekar analyzed their data, gave presentations on their work at the XI ARS and wrote their final reports. Their theses were submitted in October 1997, and the researchers have since been awarded the PhD. In December 1997, Johnsingh and the researchers visited Shimla to present the findings of the ibex project study before the officials of the Himachal Pradesh Forest Department. In January 1998, Dr Michael Stuwe arrived to discuss the project report, and after due incorporation of his suggestions, the report was finalized.

\* **The ecology and conservation of Indian Giant Squirrel**

**Principal investigator : Dr Renee Borges**

**Researchers : Subhash Mali and Hema Somanathan**

This study, carried out in association with the Bombay Natural History Society, Mumbai, investigated the food selection and ranging pattern of Malabar giant squirrel and examined the relationship between food availability and the animal's reproductive success. This study was located at Bhimashankar wildlife sanctuary in Maharashtra which supports a good population of the Malabar giant squirrel.

The project was completed in September 1997. The final presentation of the project

findings and its draft report was made to the Chief Wildlife Warden, Maharashtra and other forest officials at Mumbai in January 1998. The final report is now being prepared and printed for circulation to various field managers. The researchers have also completed their PhD theses.

\* **Survey of animal damage problem in and around protected areas and managed forests: Phase-II Uttar Pradesh, Rajasthan and Himachal Pradesh.**

**Faculty :** Dr NPS Chauhan

**Researcher :** Dr KS Rajpurohit

In India, most of the protected areas are fragmented and disturbed from human activities, cattle grazing and resource exploitation. The encroachment on forest lands and the loss of habitats and habitat quality, has not only drastically reduced wildlife in the country but also ecologically dislocated many species from their former ranges. The disoriented animals often stray into human habitations, resulting in increasing conflicts and destruction of life and property. Cases of human killings, cattle lifting and crop raiding by wild animals are being reported from virtually every state in the country. However, the extent of the problem is neither properly defined nor clearly understood; and information available on the issues is scanty and scattered.

This project was started with the objectives to collect factual information on the nature and extent of damage and on the paradigms of conflicts with people in different states, and accordingly suggest strategies to minimize the problems. It was decided to conduct this study in two phases, covering six states in all. Madhya Pradesh, Bihar and Orissa were taken up in Phase I, while in Phase II, Rajasthan, Uttar Pradesh and Himachal Pradesh were covered.

The project is now complete.

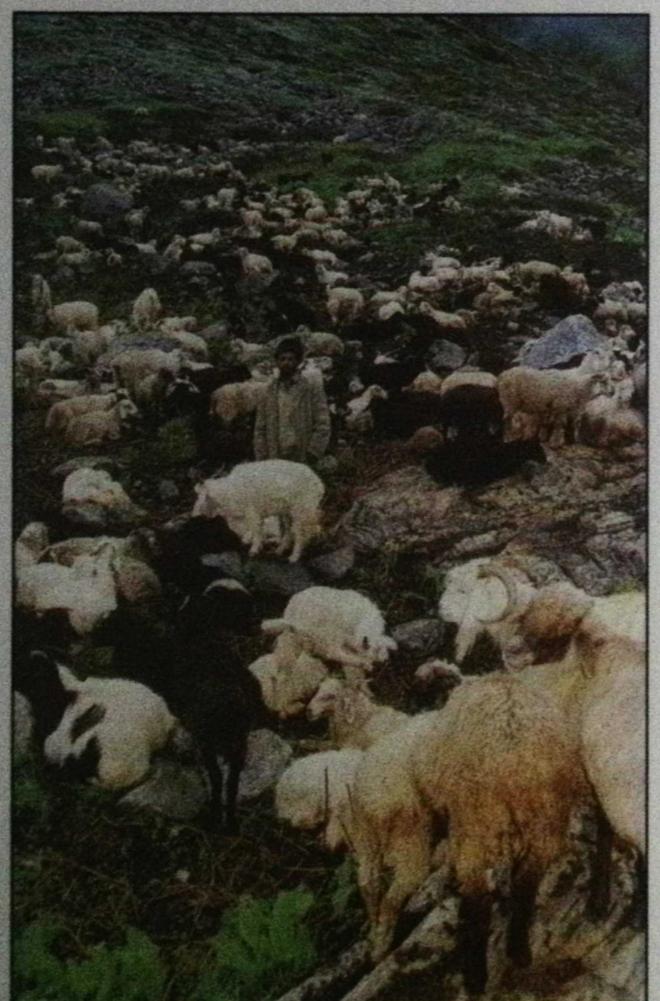
## ONGOING PROJECTS

\* **A study on the conservation status of high altitude forests in Garhwal Himalaya, Uttar Pradesh**

**Faculty :** Dr GS Rawat and Dr Asha Rajvanshi

**Researchers :** Anjali Awasthi and Sanjay Uniyal

The Bhagirathi catchment in Garhwal Himalaya has been in the limelight in recent years due to the proposed construction of a mega-hydroelectric project (Tehri dam) on the river Bhagirathi. The upper regions of the Bhagirathi also attract thousands of pilgrims, tourists and adventurers visiting the Hindu holy shrine at Gangotri, the mouth of the river Bhagirathi (Ganga) and for the area's scenic grandeur. However, with the upward migration of some families from the proposed dam submergence area and consequent increase in local population and excessive



A flock of migratory sheep and goats in Khiron Valley.

G.S. Rawat

tourism, there is a fear that the surrounding forests in the catchment may degrade rapidly. With this in view, a study on the patterns of resource availability and utilization and the possible effect on the forests is being conducted in Saura-Belak area (1700 - 3400 mts above msl) located in the upper catchment of river Bhagirathi, Garhwal Himalaya.

The major objectives of the project are to (i) collect baseline information on composition and dynamics of different high altitude forests in the Bhagirathi Valley; and (ii) assess the impacts of landuse practices on high altitude forests and wildlife in the study area.

During the year under reporting, field work was carried out to quantify the structure, composition and standing biomass of woody vegetation along altitudinal and human use gradients. Direct observations together with structured questionnaires were used to assess the biomass utilization pattern (fuel and fodder) by the villagers. This data was collected from permanent settlements as well as from the summer cattle camps on a monthly basis to gauge the pressure on forests in various seasons. A survey of rare and threatened plants in the study area is also in progress.

\* **Impact assessment of tourism in Corbett national park, Uttar Pradesh**

**Faculty :** Bitapi C Sinha, Dr BK Mishra and UK Bhattacharya

**Researcher :** Manisha Thapliyal

Corbett national park is one of India's foremost and most popular protected areas, with an average annual visitation by 40,000 tourists of which 10% are foreigners. Out of the national park's total area 520.8 sq km, the tourism zone covers 115.096 sq km. There are two campsites located in the tourism zone - Dhikala where night stay is permissible, and Bijnor where only daytime visiting is allowed.

The objectives of this project are to (i) gather information on the current status of tourism in the national park, and (ii) identify and

quantify the impact of tourism on habitat and wildlife so as to plan sustainable tourism that would be compatible with conservation. During the reporting year, the present status of tourism and its management was assessed. The park records were examined and a structured questionnaire administered at Dhikala and Bijnor to gather visitor statistics - like visitor numbers, trends of monthly visitation, duration of stay, group size, domicile, repeat visitation, accommodation, etc. besides visitor feedback with respect to "Visitor satisfaction" and "Visitor expectations". A total of 351 user units were surveyed.

Visitors rated wildlife viewing from elephant, tiger sighting and enjoying peace and solitude as their three most important interests in the park. It was also found that for them the print media and word-of-mouth are the two main sources of information about Corbett national park.

To determine the non-biodegradable garbage left by visitors to and from Dhikala and Bijnor, the roads from Dhangarhi to Dhikala (31 km) and Aamanda to Bijnor (7 km) were surveyed and sampled four times during the tourist season. The garbage left enroute by the visitors was assessed and found to be considerable.

\* **Behavioural ecology of caracal in Sariska tiger reserve, Rajasthan**

**Faculty :** Dr SP Goyal and Dr AJT Johnsingh

**Researcher :** Shomita Mukherjee

India has the highest diversity of cats in the world but it is mostly the larger cats which have received attention from scholars as well as managers. The smaller cats, however endangered, have largely been ignored in that respect. This study sought to collect information on the habitat use and feeding ecology of small carnivores - the caracal (*Caracal caracal*), jungle cat (*Felis chaus*) and jackal (*Canis aureus*) in Sariska tiger reserve.

The abundance of rodent, a major prey item in the diet of these carnivores, was estimated

in five habitats (open scrub, dense scrub, grassland, mosaic and hill forest) using the Sherman traps. Grass height, bush cover, disturbance by domestic livestock and abundance of carnivores were quantified. The scats of small carnivores were analyzed to estimate their food habits; and scat diameters and thin layer chromatography were used to differentiate between their scats. The different food items for each predator were compared using 95% bootstrap confidence intervals. The rodent species occurring in scats were identified and quantified from their dentition.

Data analysis showed a negative correlation ( $r_s = -0.80$ ,  $p = 0.10$ ) between rodents abundance and domestic livestock use. The results of track plots and direct sightings indicated that the jungle cat used dense scrub more than other habitats whereas the jackal largely used the open areas (open scrub and mosaic). All evidences of the caracal were obtained from open scrub.

It is found that mammals constitute the major prey in the diet of small carnivores (more than 90% of scats of all predators). Among mammals, rodents form the most important prey, occurring in over 75% scats of all predators, and in significantly higher percentage ( $p < 0.05$ ) of scats than birds, reptiles and invertebrates. Energetics determined for bobcat (*Lynx rufous*) and coyote (*Canis latrans*) were extrapolated to the felids and jackal respectively to estimate energy obtained from rodents. All three predators were found to obtain a substantial amount of their energy from rodents, with felids obtaining 60-90% energy and jackal (40-70%).

Three rodent species were identified in the scats - *Tatera indica*, *Golunda elioti* and *Mus*

*platythrix*. Predators seemed to consume *T. indica* and *M. platythrix* according to availability, with jungle cat and jackal consuming more *T. indica* and caracal consuming more *M. platythrix*. However, *G. elioti* seems to be preferred by all the three predators, although no captures were made of this most important rodent prey in the scrubland.

Mukherjee's presentation at XI ARS won her one of the top-five awards (see Courses, Workshops, Seminars - Organized). The report is complete and the project is to conclude in April 1998.

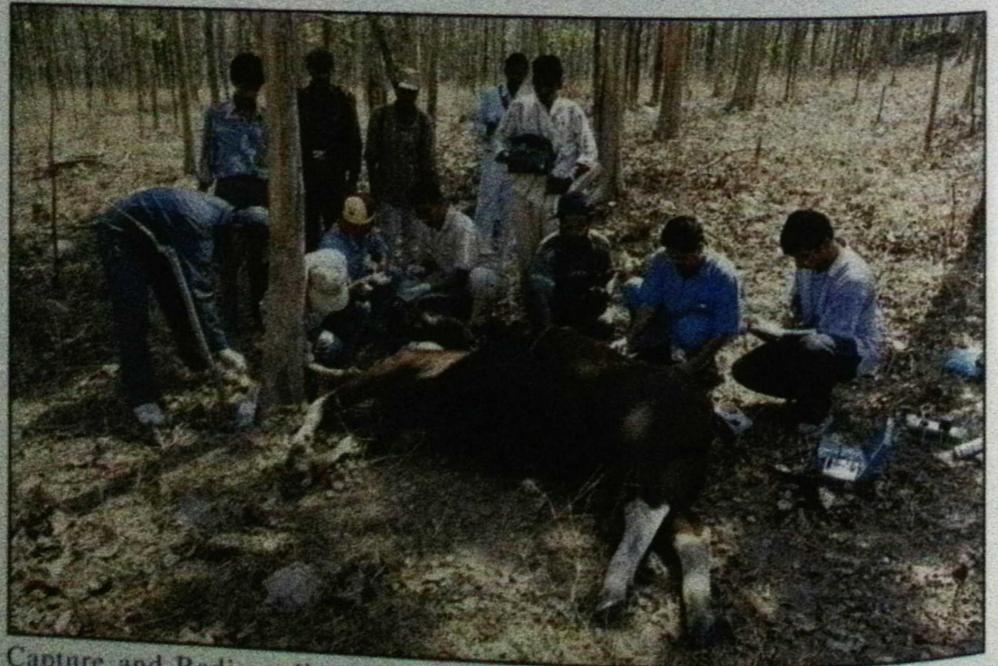
**\* Ecology of gaur (*Bos gaurus*) in Pench tiger reserve, Madhya Pradesh.**

**Faculty :** Dr. K Sankar and Qamar Qureshi

**Researchers :** Mohd. Khalid Syed Pasha and G Areendran

The objectives of this study are to collect information on the distribution, density, group size and composition, diet, home range and habitat use of gaur in Pench tiger reserve and accordingly make recommendations for its better management.

Various tasks were conducted in the field during the year. In May 1997, two gaurs (an adult male and a female) were chemically



Capture and Radio collaring operation of gaur in Pench Tiger Reserve.  
Khalid Pasha

immobilized in the national park area of the tiger reserve and radio-collared so as to study their home range, activity pattern and habitat use. These animals were then tracked and monitored in different seasons. Their estimated summer home range was calculated as 12.61 km<sup>2</sup> (for the male) and 7.25 km<sup>2</sup> (for the female). The monsoon home range of the male and female was 7.62 km<sup>2</sup> and 13.8 km<sup>2</sup> respectively. During the same period (summer and monsoon), a total of 820 gaurs were classified into various age and sex classes. There were 67 males to 100 females, and the female : calf ratio was 100:7.

Twelve permanent line transects and three vehicle transects have been walked/monitored in different seasons for ungulate density estimation, as a result of which density information on gaur, chital, sambar and nilgai have been calculated for summer and winter periods. Data on group size, age and sex ratio, female-young ratio and habitat use of other wild ungulates were also collected. Indirect estimates of the wild ungulate abundance were calculated from dung/pellet counts along the line transects.

Five one-hectare plots were permanently marked for vegetation studies in major vegetation types in the intensive study area. The ground layer biomass, litter biomass, litter decomposition rate, and the phenology of major trees, shrubs, grasses and herbs were monitored in all seasons in these plots. Additionally, two one-hectare permanent plots were laid and monitored in burnt and unburnt areas (miscellaneous forest) for the study of impact of fire on plant communities.

It is now planned to capture eight more gaurs for collecting their tissue and blood samples and radio-collaring.

**\* Ecology and management of problematic sloth bears (*Melursus ursinus*) in North Bilaspur forest division, Madhya Pradesh.**

**Faculty :** Dr NPS Chauhan

**Researchers :** Harendra Singh Bargali and Naim Akhtar

Sloth bears has suffered as much as any large

mammal from human impacts on forested areas and consequent habitat loss and fragmentation. As a result, there is an increasing trend in cases of bear-man conflicts within the protected areas as well as in the forests outside, in plantations, agricultural fields and even human habitations. This is directly affecting conservation efforts. Moreover, the information available on the species is clearly inadequate as a basis for formulating sloth bear conservation and management plans.

This project seeks to study the ecology and management of sloth bears, which will provide a basis for developing an action plan to mitigate the problems of bear-man conflict effectively in the long term. The study is located in the Marwahi and Pendra ranges in North Bilaspur Forest Division, Madhya Pradesh. The study area harbours a large number of sloth bears, but the habitat available is highly degraded, where the forests are fragmented and surrounded by villages and agricultural crop fields. As many as 62 villages within the two ranges have reported cases of bear-man conflict. While this study is site specific, its findings would be equally applicable to similar habitat situations elsewhere in India.

The specific objectives of the project are to (a) prepare habitat maps and quantify vegetation composition and structure within each habitat; (b) assess the distribution and population density of sloth bear in the study area; (c) quantify habitat use and ranging patterns of sloth bear, using telemetry; (d) assess seasonal changes in the sloth bear's dietary intake; (e) assess bear-man conflicts, its nature and extent; (f) develop capture techniques and conduct trials on capture and release of problematic bears to suitable forest areas; and (g) formulate recommendations for mitigation of bear-man conflicts, and suggest conservation and management plans for sloth bears in the region.

This project was started in April 1996 but had to be halted in August 1996 when the two researchers working on the project left it. It has now been revived after a gap of about a

year and half, with new researchers joining it in February 1998. During February and March 1998, the researchers did their literature readings, collected bibliographic information pertaining to the ecology of sloth bears and problem areas, completed base maps and digitized them and developed formats for use in the field areas.

**Establishing computerized wildlife database for conservation monitoring and evaluation in Tadoba-Andhari tiger reserve**

**Faculty :** Dr. VB Mathur

**Researcher :** Yogesh K Dubey

The country's protected areas suffer from lack of precise or accurate and standardized methodologies for collecting data or even for conducting routine surveys for monitoring vegetational and animal distributional changes. This hampers proper planning in the first instance and subsequently prevents effective implementation of the management plans. In the current wilderness area scenario, where problems and issues are often multifaceted, the managers need to have enhanced management planning capabilities for the proper implementation of their management plans. One of the ways this can be done is by developing simple, rapid, field friendly and computer compatible methods for data collection, collation and analyses. It was with this idea that the current project was started in 1994 to develop computerized database on spatial as well as non-spatial attributes using ecological, managerial and socio-economic data.

During the current year, data collection and analysis on all aspects of habitat utilization, ungulate density estimation and distribution was completed. A fire hazard map and fire risk modelling of the study area was also accomplished. Field exercises were conducted for the forest guards with the objective of motivating and training the field staff. As, the tiger census operations were conducted in the study area during the year, the researcher interacted with the field staff and imparted training for enhancing their skills in census operations.

The field work for the research project ended in June 1997. The researcher is now analysing the data and writing the final report.

The findings were presented at the Annual Research Seminar wherein the researcher was adjudged as one of the awardees.

**Developing area specific management guidelines for conservation of biodiversity in Satpura Conservation Area, taking into account the forestry objectives and local people's needs.**

**Faculty :** VB Sawarkar and Dr PK Mathur

**Researchers :** Prachi Mehta and Azra Musavi

Active scientific management for the conservation of wildlife in managed forests, though a relatively new concept in India, is already seen as vital to the future planning of the PA network in the country. This project aims at integrating the concerns for ecological integrity, forest management issues and local people's social and economic stakes within the landscape; and this is sought to be achieved through an assessment of the concerns and issues and identification of potential synergistic strategies.

The concern for ecological attributes *vis a vis* objectives of forest management strategies were tested through separately established guilds of bird species across their three dimensional niches, their sensitivity to varied habitat conditions and changes occurring in the vegetation structure and composition as a result of silvicultural practices. The socio-economic interests of the people were investigated through the connectivity of a range of people's activities, their ecological consequences and an assessment of potential sustainable opportunities for developing alternatives.

The project should have completed on 31 December 1997. However, there were some unforeseen technical problems with data analysis. As such, an extension for five months was sought for the purpose.

**Ecology of tiger: To enable a realistic projection of the requirements needed to maintain a viable population of tigers in India**

**Faculty :** Dr RS Chundawat

**Researcher :** Neel Gogate

After the success in tiger conservation in the seventies and eighties, the tiger population is again on a down-slide in the last few years, which necessitates looking into the problem afresh. This project, started in December 1995 seeks to study the tiger's feeding ecology, habitat utilization, home ranges and movement patterns. It is hoped that on the basis of such data it will be possible to make a realistic projection of the requirements (prey as well as minimum protected area size) needed to maintain a demographically viable population of tigers. This will help in predicting the potential of India's PA network for conserving tigers and their habitats, and also help target programmes for managing crucial tiger habitats and large carnivore population.

The field work for the study is being conducted in Panna national park which is sub-optimal tiger habitat. Last year three tigers (two females and one male) were radio-collared. One of the tigress died and in December 1997 the transmitter of the other tigress (adult) stopped functioning. Radio tracking of the male, however, continued. Its home range has been calculated as 243 sq km, covering about 45 % of the national park area. This is also the largest home range recorded for tigers in the Indian sub-continent.

In March 1998, a female sub-adult tigress was radio-collared. Data on other aspects such as biotic pressures, ungulate densities, kills and scats are being collected.

**Evaluation of elephant habitat in Singhbhum, Bihar, in relation to fragmentation, degradation, mining and other disturbance factors**

**Faculty :** Dr Sushant Chowdhury and Dr Asha Rajvanshi

**Researchers :** RK Singh and Prabhat K Bhagat

The Singhbhum forests in the Chotanagpur plateau in south Bihar once had the finest sal forests in the country and were a prime habitat for the elephants. Today, these forests are fast losing their floral and faunal splendour, largely because they have not been accorded a protected area status and because of the widespread improper landuse and counter-development activities taking place there such as heavy mining, illegal felling and hunting. The objectives of this study are to look into (a) the effect of iron-ore mining on elephant habitat, and (b) the effect of forest fragmentation on spatio-temporal uses.



Radio collared tigress with cubs on a kill in Panna National Park.  
R.S. Chundawat

The findings on the former reveal that the discharge from the iron ore mines into the Koina river has reduced the riverine habitat values of this river which was once critical for the elephants, particularly during the summers. Consequently, the elephants started avoiding the river. However, it has also been noticed

that the water quality regime improved dramatically when the discharge remained regulated, which means the river's ecosystem health can be restored if the discharge is kept within permissible limits.

On the forest fragmentation aspect, forest patches in four size categories were identified in prime Singhbhum constituting 92% of the forest area, to study their utilization by elephants. Marked transects varying from 1-3 km were carried out in 86 sample plots and random transects of 2 km were carried out in 216 sample plots (108 km. length). Habitat attributes, habitat occupancy on the basis of dung density, utilization and disturbance factors were recorded and analyzed to establish the relationship of these factors with habitat patchiness.

Plant species occurrence relationship with patch size categories findings revealed that there was over 50% reduction in plant species occurrence in smaller patches (5-45 sq km) as compared to the large patches (>200 sq km). A similar pattern emerged for the elephant food plant distribution in smaller to larger patches. The habitat utilization and occupancy trend showed higher plant species utilization/ hectare and dung density in the bigger patches as compared to smaller one. On the basis of dung density distribution, the elephant population in Singhbhum forests was estimated to be 287-306.

Sociological surveys through radial transects laid within 2.5 km radius were conducted to find the anthropogenic pressures as a result of siting of the townships of Kirburu and Meghatuburu iron-ore complexes in the adjoining forests. The results showed that 98.9% of the approximately 2500 labourers living in 400-450 family units are fully dependent on the forests for fuelwood and household timber requirements. Habitat degradation as a result of such extraction is further reflected by profuse weed seedlings occurrence @ 81.00 per hectare here against 3.00 per hectare in less impacted zone. Ecodevelopment measures were suggested for tackling such pressures on forests.

The field work of both the researchers is over and they are now in process of finalizing their reports and writing papers on the basis of their studies for publication. One publication has already been accepted by an international journal.

\* **An ecological analysis of critical sea turtle habitats along the Orissa coast for development of a scientific sea turtle management strategy**

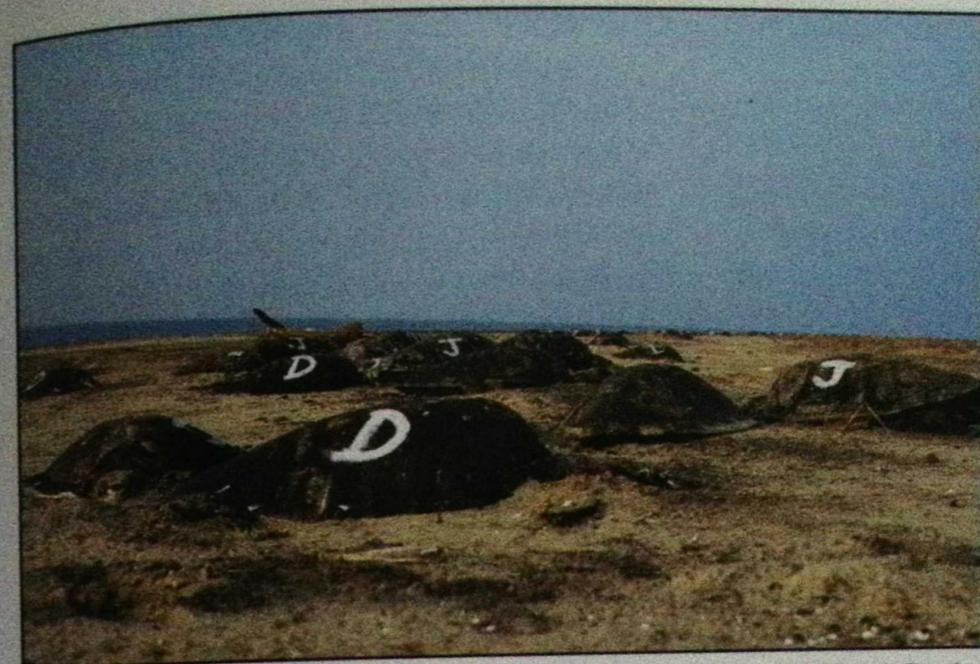
**Faculty : BC Choudhury**

**Researcher : Bivash K Pandav**

Of the four sea turtle species found in the coastal waters off Orissa, only the Olive Ridley is known to nest - at three mass nesting beaches or rookeries at Gahirmatha (largest known in the world), Devi and Rushikulya which was discovered during WII survey four years ago.

As a follow-up of that survey, this project was started in 1995 to do an analysis of critical sea turtle habitats and develop a scientific management action plan to ensure their long-term survival and continued mass nesting along the Orissa coast. While making a scientific evaluation of off-shore breeding habitat and on-shore nesting habitat *vis a vis* biotic, abiotic and anthropogenic impacts, the action plan would include nesting, habitat protection and management strategies, habitat restoration plans, avenues for future scientific research and development of public awareness programmes.

The 1997-98 winter was the penultimate nesting season for field data collection. But for the last two years, and again this year, the mass nestings have not taken place which are a serious setback to the project. The researcher has, however, been able to collect significant information on the impact of anthropogenic activities on the sea turtles. Trawler fishing related mortalities in sea turtles, was documented season wise as well as site wise. Information on this will help develop proper fishing control. Geomorphological changes in the nesting beaches by subsidised predators were also



Dead turtles piled on the beach in Orissa coast.

Bivash Pandav

quantified and projection made on their future impact on the sea turtle populations.

Based on the recovery of tagged turtles from different nesting beaches in Orissa, we recommend a "metapopulation management approach" for the management of sea turtles rather than solitary nesting beach protection and management approach. Other management options recommended include people's participation in nesting beach protection and management, experimental removal of casuarina, use of turtle exclusion devices (TED) for curtailing sea turtle mortality, etc.

\* **An ecological study of sympatric hornbills and fruiting patterns in a tropical forest in Arunachal Pradesh**

**Faculty : Dr GS Rawat and Pratap Singh**

**Researcher : Aparajita Dutta**

Five hornbill species are found in Arunachal Pradesh, of which three are endemic to the north-east India. These species have a primarily frugivorous diet and specialized nesting requirements, which makes them highly vulnerable in a degraded habitat. As hornbills are important seed dispersal agents

of various primary forest species, their vulnerability and depletion threatens a host of their food plants which exist on mutual dependence. It was with the idea of gathering information on their ecology and status before it is too late that this project was begun. In fact, this study located at Pakhui wildlife sanctuary (Arunachal Pradesh, west) and Namdapha tiger reserve (Arunachal Pradesh, east) is the first comparative ecological study on four sympatric hornbills in India.

The primary objectives of the study are to : (a) identify the extent of seasonality in fruit production in the tropical forests of Arunachal Pradesh, and therefore the lean and peak periods; (b) know the alternatives available to the hornbill and other frugivores during lean seasons, (keystone resources if any); (c) study the behavioral strategies adopted by the animals to cope with fruit shortages, the existence of any seed disperser specificity between hornbills and some of their food plants, and (d) understand factors underlying fruiting patterns through comparison of the dispersion of fruiting periods among various species.

During the reporting period, phenology plots and trails were established and monitored on a monthly basis. Nests of two hornbill species were located and data was collected on their diet, visitation frequency and other aspects of their nesting biology. In addition, several roost sites were located and a network of trails was established to facilitate observations on hornbills. Data on the breeding biology of the wreathed hornbill were analyzed and the results presented at the XI ARS.

## Bird Survey in selected localities of Arunachal Pradesh

Faculty : Pratap Singh

Under this project, funded by the Oriental Bird Club, four bird survey visits were conducted in different localities of Arunachal Pradesh.

The above four visits resulted in adding about 20 species of birds to the list of Avifauna of Arunachal Pradesh, besides interesting information on range extension of some species have been obtained. One more visit is intended to be made in June/July 1998. The report will be submitted by December 1998.

## PROJECTS IN FOREIGN COLLABORATION

### US-Fish and Wildlife Service Phase I

#### Conservation of Indian Wolf

Faculty : Dr YV Jhala

Researchers : Dr Dinesh K Sharma, Bharat Jetwa and Reema Pandey



Radio collaring of Wolf in Velavadar National Park, Gujarat.

Dinesh K. Sharma

The wolf is a major predator in the semi-arid grassland-scrubland habitats of India, but it is on the endangered list of Indian fauna. Yet, it has not been given any serious attention - neither in the form of detailed scientific studies on its ecology nor in any effort to protect it. On the contrary, the animal remains widely persecuted; the rumours and imaginative fears of its ugly ferocity adding to its plight.

However, from the limited scientific information available on the subject, it is clear that the wolf has not yet reached the end of the road, and that it can be effectively conserved, but for this efforts and actions need to be taken immediately.

This study seeks to provide insights into the basic parameters of wolf ecology so as to help formulate a national strategy for its conservation. The specific objectives are to - (a) estimate wolf population and distribution in India; (b) evaluate the population dynamics, food habits, prey biomass needs, energetics, home range and territory size of wolves; (c) study the conservation genetics

of wolf populations; (d) identify viable wolf populations for conservation; and (e) gain a scientific understanding of the human-wolf conflict and suggest remedial measures. The study is located in three representative areas - Kutch and Bhal (Gujarat) and one site in Maharashtra - which span different aspects of the socio-economic and ecological factors affecting wolf conservation.

Though the study is still in its early stages, the analysis of the data already gathered reveals several interesting and important points. For one, the Indian wolf population which, in the early 1980's, was considered to be patchy and highly vulnerable, actually has a range that is almost continuous throughout peninsular India. Given the good dispersal ability of the species, it seems unlikely that Indian wolf would suffer from inbreeding and loss of genetic variability - problems that are associated with small packed populations. Our genetics study later in the project would likely shed more light on these aspects; but it is clear that the most serious threats to surviving wolf populations are loss of breeding habitats and direct persecution by humans.

There is a wide variability in the territory sizes of wolves that we have been studying (80 - 1000 km<sup>2</sup>). This can be attributed to the availability of food and habitat resources within the territories, although the data on resource availability are still inconclusive.

Analysis of about 150 wolf scats show that domestic livestock form a major component of the wolves' diet at our study sites in the Bhal and Kutch regions. In many areas wolf predation on sheep and goats is a serious economic and social problem that needs to be addressed at a different level if wolves are to continue to survive in such conflict areas.

Human factors are an important cause of mortality in both juvenile and adult wolves. These are particularly high where wolves

predate primarily on livestock. In such areas, wolf dens are sought out, pups burnt or clubbed to death and adult wolves poisoned. Some form of mitigation measures, education and awareness campaigns and enforcement of legal protection for wolves are needed immediately in such conflict areas. Strict punishment needs to be imposed for use of poison to kill wolves. But at the same time, the poor pastoral community needs to be compensated in some form for loss of livestock to wolf predation.

In areas where conflict with humans is low, canine distemper is the major cause of wolf mortality - although this too is human related to some extent, since it is spread through the high density of feral dogs that abound around villages.

Last year, we had investigated the incidence of wolf attacks on children in eastern Uttar Pradesh, where over 50 children were reported to have been thus killed. We concluded that the culprit in these killings was indeed a wolf - but it was a single wolf, and not a whole pack, as the story at the time was being circulated. We concluded that though wolves can pose a threat to human lives, as evidenced by this experience, such cases are an exception and should be viewed in their special ecological, social and economic context.

In this study, we are also looking at the scarcely studied hyenas and our data suggests the species to be a social animal. Their existence in pastoral and human areas (in Kutch) is not directly threatened by human persecution but more by habitat loss. Wolf and hyena food habits differ significantly in Kutch where carnivores are sympatric.

US-FWS is providing the major grants for this project, but funds for the study have also been obtained from the National Geographic Society, National Fish and Wildlife Foundation and Center for Field Research (Earthwatch).

## Phase II

### \* The relationships among large herbivores, habitat, and humans in Rajaji-Corbett NPs

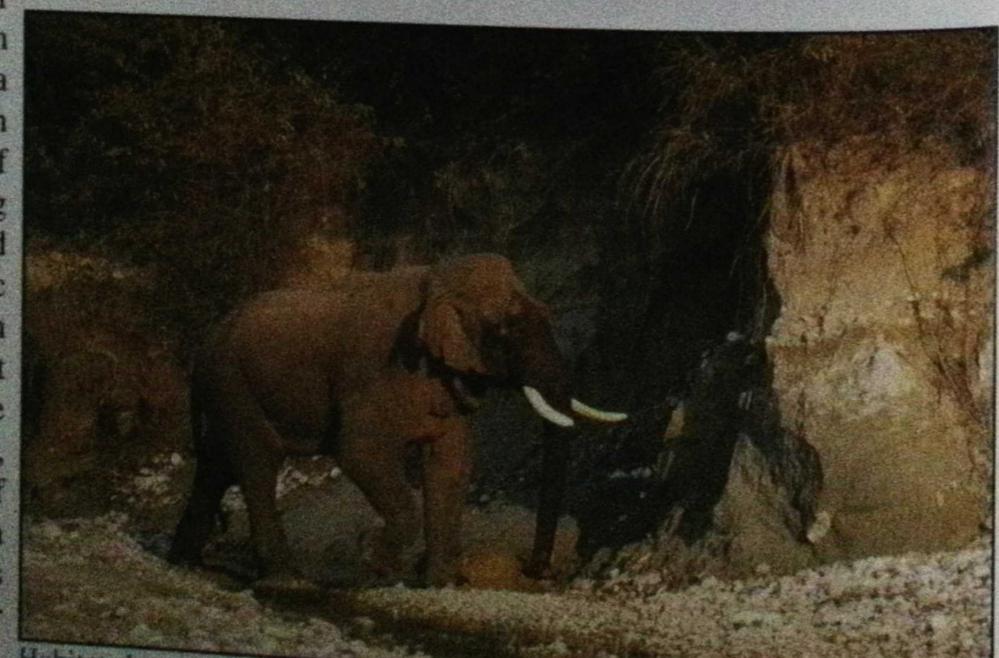
**Faculty :** Dr AJT Johnsingh, Dr SP Goyal, Dr GS Rawat, Dr Asha Rajvanshi and Dr Paul Krausman

**Researchers :** A Christy Williams, Aparajita Hazra and Joy Das Gupta

The Shivalik hill ranges, from Jammu in the north-west to Bengal in the east, cover about 40,000 sq km but it is only the stretch between Yamuna and Kosi rivers in Uttar Pradesh which abounds in wildlife. This stretch also has two protected areas-Rajaji national park and Corbett tiger reserve, which harbour the elephant and tiger and a host of other animals. However, both protected areas are under increasing threat of fragmentation from development projects and severe biotic pressures from the people living in and around them.

This project seeks to assimilate data which would help wildlife managers make informed management decisions. The researchers will prepare habitat maps, quantify herbivore abundance and distribution and quantify the pressure and impact by people and their livestock.

One of the researchers working on the elephant component of the project has been collecting intensive data since last two years on the distribution pattern of the elephants, estimating their densities and quantifying biotic pressures to establish grades of habitat disturbance. During the year under reporting, with radio-collaring of two more adult males, a total of eight elephants (four bulls and four



Habitat degradation is the main threat to the elephant population in Rajaji National Park.  
Christy William

cows) are being currently radio-tracked, which have revealed interesting facets of elephant social organization, breeding behaviour, crop-raiding, habitat use and seasonal movement patterns. Age and sex structure data collected from Corbett and Rajaji national parks show that these elephant populations have one of the best adult sex-ratios (1:2 male:female ratio) in the range of the Asian elephant. They also have a healthy age structure. Habitat degradation seems to be the main threat to the Rajaji elephant population. A presentation by Williams, emanating from this component of the study, was made at the XI ARS and adjudged as one of the 'top five' (see Courses, Workshops, Seminars - Organized).

A Technical Assistant was hired (June-November 1997) to collect baseline maps pertaining to the study area, available with different agencies in Dehra Dun. These maps, particularly the outlines of the study area, major vegetation types, drainage and other features were then digitized using the ArcInfo software for further analysis. In February 1998, Hazra was appointed to carry out this further analysis and work on the vegetation aspect and Das Gupta joined to study the human impact component of the project. The project still needs one more researcher, to do the goral study.



Kakachi *Calotes andamanensis*. First record from mainland of India since its description about a 100 years ago.  
Saravanakumar

### \* Impact of fragmentation on the biological diversity of rainforest small mammals and herpetofauna of the Western Ghats mountains, south India

**Faculty :** Dr Ajith Kumar (SACON), Dr Ravi Chellam, BC Choudhury and Dr Barry Noon (Colorado State University)

**Researchers :** Karthikeyan Vasudevan, Divya Mudappa, NM Ishwar

In the last few decades, the rainforests of the Western Ghats have suffered immense habitat loss which have rendered them severely fragmented. This is a matter of serious concern because for many species the effects of fragmentation, manifesting over a long period of time, have the same consequences as extinction. With the existing rainforests now having been brought under the protected area network, it is extremely important that the management options towards conserving these remnant patches of rainforests be assessed urgently.

The objectives of this study are to (a) identify major factors governing faunal (herpetofauna

and small mammals) distribution and abundance in a large, contiguous and relatively undisturbed rainforest in Kalakad-Mundanthurai tiger reserve; (b) identify changes brought about by habitat fragmentation on habitat structure and microclimate, and relate these changes to those observed in faunal distribution and abundance in the rainforest fragments of Anamalai hills; (c) develop a set of statistical models based on the above two objectives, which would allow the prediction of faunal changes as a function of fragmentation; and (4) carry out a survey across the Western Ghats to validate the predictions of the models.

The study is located in Kalakad-Mundanthurai tiger reserve (KMTR) and Indira Gandhi wildlife sanctuary (IGWLS). During 1997-98, field work was carried out at both study sites. Sampling for amphibians was completed at the three intensive study sites in KMTR and since December 1997 the researcher has begun work in the forest fragments in IGWLS. The sampling for reptiles is still continuing at KMTR and the researcher should be shifting by the time the monsoon sets in to commence sampling in IGWLS. Sampling for small mammals (rodents and insectivores) has been completed in KMTR and in the matrix between forest fragments and plantations. Currently plans are underway to begin aut-ecology studies on small carnivores at KMTR.

This project has an additional collaborator in Salim Ali Centre for Ornithology and Nature Conservation (SACON), Coimbatore.

### **Identify potential areas for conserving biodiversity in the Indian Himalayas**

**Faculty :** Dr VB Mathur, Dr RS Chundawat, Qamar Qureshi, Don Hunter and Dr Rodney Jackson

**Researchers :** Rashid H Raza, Meera Anna Oommen and R Jayapal

The Himalaya is a region of high diversity, in terms of both floral and faunal assemblies, much of which is unique. But the region is one of the most actively degrading ecosystems in the country with consequences reaching far outside its geographical spread. At the same time, it is inadequately represented in the country's protected area network. In an area where it is quite arduous and expensive to conduct large scale surveys of biodiversity, this project was initiated to develop scientifically reliable techniques based on remote sensing and GIS technologies for identifying areas of conservation importance.

The specific objectives of the project are to (a) build a biodiversity model from targeted survey of vegetation and mammals; (b) apply this model to protected and unprotected areas representing two major biogeographic zones in the Indian Himalaya; and, on the basis of this, (c) write a biodiversity action plan for the Indian Himalaya. The study sites of the project are located in the states of Uttar Pradesh, Himachal Pradesh and Jammu & Kashmir.

During the year under review, field work was concentrated in Govind Pashu Vihar and Kedarnath wildlife sanctuary in Uttar Pradesh. The field data collection methodologies which had been refined earlier, were used to collect data on vegetation, birds and landuse pattern.

A review meeting to discuss the project goals, objectives and progress was held in Corbett tiger reserve in March 1998 in which the faculty members, researchers and two US counterpart scientists participated. It was

agreed to develop habitat models for the snow leopard, Ladakh urial, musk deer and a biodiversity model based on digital terrain model, field data and satellite imagery.

### **Evaluating Panna national park with special reference to the ecology of sloth bear**

**Faculty :** Dr AJT Johnsingh and Dr Clifford G Rice

**Researchers :** K Yoganand

The sloth bear is a widely distributed large carnivore of the Indian subcontinent, but little is known of its ecology and behaviour. This study, seeking to enhance our knowledge on the species, is being carried out in Panna national park which has sloth bear population in what is considered an optimum sloth bear habitat. The findings of this study will help establish a basis for its conservation.

In April 1997, one young adult female bear was radio-collared. Although this brought the number of radio-collared bears to six, there were only two bears to track throughout the year because last year, as was reported in the previous Annual Report, three bears had got rid of their collars and one had strayed outside the national park and could not be traced.

The existing two radio-collared sows were tracked intensively to gather information on their activity, daily movement and space use patterns. Scats were collected along fixed trails, forest roads and from bear resting sites. Following cursory analysis, the scat samples were dried and preserved for fine analyses later. The phenology of the bear food plants and some other dominant species along trails are being monitored twice every month. Scat and bear digging abundance are being monitored along fixed trails. The information from these trails, along with the information from radio-tracking would help us explore if such abundance indices could be used for monitoring bear populations over the years and across different habitats.

As the main food sources of the sloth bear are ants and termites, we are trying out several

methods to quantify their relative abundance across various habitats and over seasons. Both the radio-collared sows bred during the late dry season and denned for cubbing during the cold season (December to February). Their continuous monitoring provided us some interesting and new information on their cubbing behaviour.

The human-bear conflict around Panna was also studied and this was related to the radio-collared bear activity and movement patterns. On the basis of the findings of this, suggestions were made to the park management and the people for reducing such conflicts. Earlier, in June 1997, a request for radio-collaring additional bears was made to the Madhya Pradesh government. The permission for this was received March 1998. Trapping was started immediately and would be continued through the coming dry season.

### **Establishment of a wildlife forensic capacity at WII**

**Faculty :** Dr SP Goyal, SK Mukherjee and Dr PK Mathur

**Researchers :** Dr Archana S Kumar, Nicky Xavier, Dr Archana Bahuguna and Dr Rajkumar

The international illegal trade in endangered species alone is valued at about 1-2 billion dollars per year. The laws against poaching are often ineffective or improperly enforced. One reason for this is that the biological remains such as blood stains, hair samples, small meat pieces, bones and highly processed products confiscated from culprits cannot be identified simply on the basis of morphological characteristics and need forensic techniques for identification. But, in India, neither have such techniques been generally available for wildlife offence, nor have the investigative and analytical procedures related to wildlife been developed. Also, reference material and standardized methods necessary for identification of species are neither adequate nor have any systematic studies been done in this direction.

WII has made a breakthrough and done some work in standardizing forensic techniques for identifying species from biological samples; and it was to develop this facility at the institute, standardize identification techniques and procedures based on morphology and serology and collect a body of reference material for the vertebrate species that the current project was started.

During the year, 96 biological products related to 38 cases of wildlife offence were referred to WII for identification. Of these, the major items were skins (40%), hair (23%), bone (7.3%) and Shatoosh shawls (6%).

An investigation into the musk and bone of wild animals, using X-ray diffraction (XRD) and florescence (XRF) techniques was taken up in collaboration with the Wadia Institute of Himalayan Geology, Dehra Dun. A microscopic examination of musk indicates the presence of white crystals, black globular and yellow brownish particles. The XRD analysis indicates an amorphous nature of the musk with a number of peaks; but no such peaks were observed in fake musk pods sold locally in the markets. Work is now in progress to characterize the peaks obtained during the XRD analysis of musk and bone.

A comparative study of the cuticular and medullar characteristics of whiskers of tiger, leopard and common palm civet is being completed and keys have been prepared to differentiate tiger whiskers from the false ones in the wildlife trade. The elephant tail hair is being used in making bracelets. We have described the characteristics of elephant tail hair to identify the species. Using Scan electron microscope, the scale patterns and surface architecture of elephant tail hair, leopard and tiger whisker, ibex, blue sheep, Angora, Tibetan antelope and Pashmina hair have also been established. Work is now being initiated to identify species from meat/tissue samples.

Two of the researchers, Dr Kumar and Xavier left during the year.

## Development of an Indian Cooperative Wildlife Health Programme

Faculty : Dr PK Malik and Dr F Joshua Dein

Wildlife health forms an important subject of teaching in the WII's various training programmes and a vital applied component in most of its research projects. The institute also interacts with, consults and advises PA managers, state wildlife agencies, animal husbandry departments and veterinary institutions. But it is neither possible nor feasible for WII to single handedly address and attend to the wildlife health needs of the entire country.

Through this project, a nationwide initiative has been taken to address wildlife diseases and related issues in a timely, effective and comprehensive manner. Toward this, an Indian Cooperative Wildlife Health Programme is being developed to advance the capabilities of select veterinary medical institutions in teaching a course in wildlife health, providing diagnosis and investigation of disease outbreaks, prevention and control of diseases in the free ranging wildlife, information exchange, education and consultation with wildlife managers, biologists and veterinary medical specialists.

So far, four Indian Wildlife Health Cooperative Centres (IWHCC) had been established - at Anand (Gujarat), Guwahati (Assam), Chennai (Tamil Nadu) and Jabalpur (Madhya Pradesh). In 1997-98, there was one final addition to the list. Hissar Veterinary College in Haryana was made the IWHCC for the Northern region, with Dr SK Mishra, Associate Professor, Veterinary Pathology, who underwent training in the XVIII the Diploma course, as its Coordinator.

The IWHCC Coordinators in Guwahati, Madras and Jabalpur had completed their US training programme in October 1995. The remaining two Coordinators - Dr RG Jani (Anand) and Dr SK Mishra (Hissar) undertook their three-month US study tour

and training from August 1997 to November 1997. The study tour, organized by Dr F Joshua Dein, exposed them to the various wildlife health and disease diagnostic facilities in the USA.

IWHCC, with the exception of the one recently established at Hissar, have been fully equipped with teaching and study aids, immobilization equipment, books, fax machines, computers with peripherals and a vehicle each. The IWHCC are now in the process of finalizing a course syllabus in wildlife health, designing wildlife health management courses for wildlife managers and field staff and writing proposals for projects to be conducted by their respective centres.

### USDA Forest Service

#### Management of forests in India for biological diversity and forest productivity - An ecological perspective

Faculty : VB Sawarkar, Dr PK Mathur, Dr SP Singh, Ajai Saxena, DVS Khati, Sugato Dutt, Dr Bruce G Marcot and Dr John F Lehmkuhl

Researchers : Dr Anjana Pant, Dr NK Ramchandran, Geeta Sunal, Ashish Kumar, Harish Kumar and Sajeev TK

The objective of this project is to evolve approaches and practices for integrated forest management planning which are essential for the conservation of biodiversity and enhanced productivity of forest ecosystems.

The study is being carried out at select sites in five states - Balphakram, Nokrek national parks and Siju wildlife sanctuary in Meghalaya, i.e. *Garo Hills Conservation Area* (GCA); Dudhwa national park and surrounding areas in Uttar Pradesh, i.e. *Terai Conservation Areas* (TCA); Satpura national park, Bori and Pachmarhi wildlife sanctuaries and the forests of Hoshangabad, north, east and south Betul forest divisions in Madhya Pradesh, and Melghat tiger reserve and the forests of east, west and south Melghat

divisions in Maharashtra, i.e. *Satpura Conservation Area* (SCA); and Anamalai wildlife sanctuary and surrounding forests in Tamil Nadu, i.e. *Anamalai Conservation Areas* (ACA). These sites represent a diversity of ecological, managerial, socio-cultural and economic challenges necessary for testing a range of options and technological templates. It is intended for these sites to serve as demonstration models leading to the development of management tools and a field guide.

During the year under reporting field studies were carried out on different aspects in the four conservation areas. In *Satpura Conservation Area*, Pant looked at the tree diversity and did the forest resource mapping. Using Survey of India topo sheets, geocoded IRS 1B LISS II satellite data (December 1995) and forest stock maps, forest maps were generated in the GIS domain (ArcInfo) for Satpura national park and Pachmarhi and Bori wildlife sanctuaries characterizing their topography, vegetation types, age-class distribution, silvicultural practices, extent of plantations, habitations and road network. Besides, 43 landuse and land cover categories were delineated and a comparison made of vegetation composition in the protected areas and the adjoining managed forests.

Ashish gathered field data on the plant diversity (particularly the tree diversity patterns in primary forest, secondary forest [shifting cultivation fallow 1-5 yrs, 6-11 yrs and >11 yrs age], plantation and grassland), mammal distribution and socio-economics in the *Garo Hills Conservation Area*. Working in the *Terai Conservation Area*, Harish's tasks were to assess grassland burning practices, habitat use by wild ungulates, availability of special habitat and resource dependency.

Dr James R Stevenson (USDA Forest Service) visited WII in February 1998 to review the progress of the project. The institute's requirement of additional budget was also discussed and accordingly a revised budget submitted to the American Embassy in New Delhi. In March 1998, two US

counterpart scientists - Marcot and Lehmkuhl arrived and visited the different field sites in GCA and TCA respectively along with WII faculty members Singh, Saxena and Khati. At the end of their visit, the pending activities of the project and further field work in the four conservation areas was fine tuned.

During the year, Ramchandran and Sunal left the institute, while Sajeev joined the project as one of the replacements.

### Funded by the World Bank

#### An ecological study of Kalakkad-Mundanthurai tiger reserve - An ecodevelopment approach - FREEP

Faculty : Sugato Dutt, Dr AJT Johnsingh, Dr GS Rawat, Dr BK Mishra, Dr NPS Chauhan, Dr MB Vishwanathan (M Sundaranar University), Dr BR Ramesh (French Institute of Pondicherry) and Dr V Chelladurai (Siddha Medical College)

Researchers : Dr Justus Joshua, N Bala Raju, Jayanti Ray, Anupama Pai, Kamini Gopal and Kaberi K Gupta

Wildlife conservation today means providing protection to not just the entire biodiversity within and around a given protected area but also harbouring an equal concern for the people living in the surrounds. The people and the protected area are being seen as the two sides of a single coin, and that any improvement in the living and economic conditions of the people would lead to a complementary improvement in the wilderness area itself.

Kalakkad-Mundanthurai tiger reserve (KMTR) in Tamil Nadu, spanning an altitudinal range from the sea level to 1800 mts above msl, boast one of the most richly diverse habitats and forest types in the country. This tiger reserve has been accorded an ecodevelopment programme as part of the World Bank funded Forest Research Education and Extension Project (FREEP). WII is the nodal agency conducting research under this programme. This research is being

done in part by WII itself and also by assigning sub-projects to the various institutions in the region. In effect, the research team is multi-disciplinary looking into the many facets of biodiversity conservation in the area.

Johnsingh and Rawat are supervising the task of inventory preparation and monitoring of the flora and fauna which will lead to drawing up the complete profile of the tiger reserve. So far, a total of 14 grids have been sampled. Besides, the biology of the Slender Loris is also studied, wherein a few animals would be radio-collared so to gather its home range data and information on the foraging behaviour and breeding biology of the species. Alongside, a micro study on the affects of fire on the ground flora of the tiger reserve is also being contemplated.

Mishra is supervising the study of biotic interferences in the tiger reserve and their impact on its ecosystem. A researcher is currently collecting data on the resource use pattern in the buffer zone of KMTR. The nature of the rural population's dependency on the forest for subsistence level income will be analyzed.

Chauhan and his researcher are looking into the man-wildlife conflict in the tiger reserve and the surrounding areas. During the current year, various aspects of crop damage and livestock depredation were investigated. Preliminary investigations reveal a high incidence of damage by wild boars while the cases of livestock depredation appear to be negligible. Analysis is in progress and the final report will draw the seasonal pattern of the conflict and damage over a calendar year.

Of the various sub-projects contemplated as part of the overall research programme, three have commenced so far. These are :-

(a) The sub-project *Ethnobotany of Kani Tribals* was assigned to the Manomanium Sundaranar University, Alwarcuruchi, Sri Paramkalyani Centre for Ecological Sciences. The Kani tribals are endemic to the region.

They are known to have deep inter-linkages with the flora and fauna in their region and this facet of their traditional life has largely gone undocumented so far. Under Vishwanathan's supervision, this study is seeking to document the day-to-day lifestyle of these tribals, and the researchers have already submitted an interim report to WII.

(b) Ramesh is supervising the sub-project *Building a Geographic Database of the Biodiversity of KMTR* wherein various important aspects such as animal habitat, topography, drainage pattern, road network as well as spatial data like income generating pattern among villagers is being incorporated into Geographic Information System. Data from the inventory and monitoring task mentioned earlier is also being analyzed for incorporation into the GIS. A preliminary task with 34 different vegetation classification types has already been delineated.

(c) The southern portion of the Western Ghats is widely recognised for its floristic richness, as a repository of a large number of endemic plants species which are acclimatised to the high rainfall pattern characterized by short dry periods in this area. The area also abounds in wild relatives of several spice species like cardamom, pepper, clove, etc. As a sub-project, a detailed *Floral Inventory in the Tropical Wet Evergreen Forests of the KMTR* is being carried out by the Tropical Botanical Garden and Research Institute, Palode, Trivandrum. Additionally, a task of doing a detailed documentation of the medicinal plants used in traditional system of Indian medicine has been assigned to Chelladurai, Siddha Medical College, Tirunelveli.

**An ecological study for the conservation of biodiversity and biotic pressures in the Great Himalayan national park : An ecodevelopment approach**

**Faculty :** BMS Rathore, Dr PK Mathur, Dr VB Mathur, Dr GS Rawat, Dr SP Goyal, Dr NPS Chauhan and Dr S Sathyakumar



Guczhi Morella esculenta, one of the highly exploited edible mushrooms in GHNP.  
Sanjay K. Singh

**Researchers :** Dr VP Uniyal, Pardeep Kumar, Sunit Naithani, Milind Saxena, Vinod TR, Sanjay K Singh, K Ramesh and Badrish Mehra

The Great Himalayan national park (GHNP) in Himachal Pradesh, is representative of the western Himalayan flora and fauna, supporting several endangered mammals and pheasants including the endangered western tragopan. There is some human population on the western and north-western boundaries of the park which depends upon the resources inside. However, there is an overall paucity of scientific information on GHNP, its attributes and biotic pressures.

This project, the second of the World Bank's FREEP in which WII is the nodal agency carrying out research and monitoring, seeks to study GHNP's biodiversity, the impact of livestock grazing, herb collection and other human activities on it and also takes a look at the socio-economic aspects of the park dependent people. Accordingly, the project will suggest ecodevelopment alternatives to mitigate these pressures and also develop an ecological monitoring system to evaluate the impact and sustainability of ecodevelopment initiatives for continuation in the long term.

Considering that ecodevelopment for biodiversity conservation is an ongoing and dynamic process, several research studies

have been initiated simultaneously. However, these studies are closely inter-related and developed through frequent interactions among the researchers, park management and other interest groups.

The project has had to face financial bottlenecks throughout, but it is creditable that the research work has not let up and in fact made significant headway. During the year, studies were conducted on - species diversity among select insect groups; assessment of the impact of livestock grazing on the national park through an integrated landscape management approach; and on developing a long-term monitoring system for the national park conservation area.

A workshop was conducted in June 1997 at Kulu, the district headquarters, to share the hitherto research findings with the World Bank Mid-term Review Mission. Among those who attended the workshop were the Chief Wildlife Warden (Himachal Pradesh) and the GHNP staff, besides project national consultants, WII faculty and researchers who gave research presentations on their respective tasks in the project. WII's research initiatives were highly appreciated, so much so that at the meeting of the Mission with MoEF in New Delhi in July 1997, it was recommended that the tasks of monitoring (both ecological and socio-economic aspects) be given to the institute.

*Funded by Ford Foundation*

\* **Building partnership for biodiversity conservation in Rajaji national park, Uttar Pradesh**

**Faculty :** BMS Rathore, DVS Khati, Ajai Saxena, Anil Bhardwaj and Dr Ruchi Badola

Given a complex situation, as in Rajaji national park, a pragmatic approach to biodiversity conservation would require building an enabling environment amongst key stakeholders based on mutual trust and confidence which will help them solve the problems affecting both habitat and local communities. It is in such an environment alone that the precepts of ecodevelopment can have any lasting effect on problem solving. Built around this premise, this project envisages capacity enhancement of key partners - local community members and the park personnel - in various competencies so that they are able to forge effective partnerships. Other project outputs include formulating model microplans from identified village clusters, conducting short-term research to bridge information gap and process documentation. The role of WII in this project is essentially that of a facilitator - helping key partners in sharing a common

platform and moving towards an institutionalized coordination mechanism, capacity building and resource mobilization.

**PROJECTS INITIATED**

\* **Impact of landuse pattern changes on habitat and ecology of sarus crane (*Grus antigone*) in the Indo-Gangetic flood plains**

**Faculty :** BC Choudhury

**Researcher :** Jatinder Kaur and KS Gopi Sunder

Concerned at the shrinking population of the Sarus cranes in India, a project has been initiated with the objective of (a) assessing the current status of sarus crane population and their habitat in their distributional range; (b) assessing the impact of anthropogenic activities and landuse pattern changes on the biology and ecology of sarus cranes; and (c) suggesting macro level and micro level management strategies to safeguard the survival of sarus cranes in India.

The researchers have so far done a literature survey on the subject and developed a questionnaire survey on the species, and are finalizing the modalities for a survey of the sarus crane in its historical distribution range covering the states of Gujarat, Rajasthan,



Sarus Crane *Grus antigone* sighted outside Nalsarovar Sanctuary in Gujarat.  
Jatinder Kaur

Maharashtra, Uttar Pradesh, Madhya Pradesh, Bihar, West Bengal, Punjab and Haryana.

\* **A study of pheasant distribution in Arunachal Pradesh, Eastern Himalaya, India.**

**Faculty :** Pratap Singh

**Researcher :** Suresh Kumar R

Pheasants are regarded as the most distinct family of birds in the Himalaya, and Arunachal Pradesh is the most richly endowed in this aspect. Of the 18 species existing in India, as many as ten are found in this north-eastern state, but as elsewhere, these are threatened as a result of habitat destruction, logging, shifting cultivation and poaching. This short-term study, initiated in February 1998, seeks to assess the status and distribution of pheasants in three districts of Western Arunachal Pradesh viz, West Kameng, East Kameng and Lower Subansiri. Funded by the Ministry of Environment and Forest, this study also aims to identify new localities for the presence/absence of pheasants with special emphasis on the distribution of the endangered Blyth's tragopan (*Tragopan blythii*), Temminck's tragopan (*Tragopan temminckii*) and Slater's monal (*Lophophorus sclaterii*). Information on other galliformes, mammals and birds occurring in the area would be collected as well.

\* **Developing a scientific model management plan for a marine protected area and drafting guidelines for coastal and marine protected area management**

**Faculty :** Ajai Saxena and BC Choudhury

**Researcher :** Sarang Kulkarni

The approximately 6000 km long Indian coastline harbours many unique coastal and marine habitats with the most complex, dynamic and diverse ecosystems such as coral reefs, mangroves, estuaries, etc. And yet, these have received scant attention in terms of research and even less in providing scientific management inputs. In fact, on this, the comparisons with terrestrial ecosystems

are rather stark whose history of scientific management development is well over a hundred years old. What adds to the predicament is that terrestrial ecosystem management methods are not always applicable directly in coastal marine areas. This is mainly because the latter are so different from the former. They are more open and, being transitional in nature, have an extremely dynamic environment.

It is only of late that the coastal and marine ecosystems have begun to receive some deserved attention. In the eighties some special reports and manuals dealing with coastal and marine areas were prepared. The Central and the concerned State governments constituted a committee on coastal areas, and a National Mangroves and Coral Reefs Programme was launched as well. A need was also strongly felt for an integrated plan for coastal zone management. However, the ideas and plans have largely remained unfiltered and very little has actually percolated to the ground. The development of the science of marine ecosystem management is still in a nascent stage; and most of the coastal protected areas do not have proper management plans and are run on, more or less, *ad hoc* basis.

Part of the general shortcomings is the unavailability of scientific data on physical and biological characteristics of coastal and marine ecosystems, a lack of knowledge and understanding of the social and economic factors which relate to their past, present and potential future human use - in short, an utter lack of information without which conservation management plans cannot be developed.

This new research project is a step toward responding to that lacuna. The project will evaluate the status of coastal and marine faunal and floral diversity in a tropical coastal protected area in relation to abiotic and biotic factors including the people related issues. It will also seek to develop a "model management plan" for it and suitable draft guidelines for integrated coastal zone management.

The project is to be located at Mahatma Gandhi Marine national park, Andamans which was created in 1983 and is only the third marine national park in India. It encompasses most of the major tropical marine habitat types, with a rich faunal and floral biodiversity. The national park also has good infrastructural support, backed by a relatively better developed marine management expertise. But there are still many shortcomings : the park has no proper management plan or long-term conservation strategy and there are many gaps in the existing management practices. The advantages and shortcomings prevalent in this national park make it an apt backdrop for conducting systematic scientific studies.

The objectives of the project are (a) to study the biological diversity of MG Marine national park for establishing baseline data on its fauna and flora; (b) to study the interdependences of various ecosystems and habitats, such as mangroves, coral reefs, tropical forests available in the study area and the impact of industries, agriculture, fishing, forestry, NTFP collection and tourism on such ecosystems; (c) to develop a model management plan for MG Marine national park; and (d) based on the above, to develop draft management plan guidelines for tropical marine protected areas.

While the study will help develop the PA's first full fledged management plan, the plan in turn will help managers in other similar marine protected areas to develop their own management plans. This first field based research project of the institute in the Union Territory of Andaman & Nicobar started in March 1998. A researcher has been appointed.

#### **Planning and development of interpretive facilities in Panna national park and Corbett national park**

**Faculty:** Ujjwal Bhattacharya, Bitapi C Sinha and DVS Khati

National parks and sanctuaries draw a large number of visitors every year. This provides the managers with a handy situation wherein

they can spread the message of conservation and make the people aware of their role in the endeavour. This is also a vital mandate in the country's efforts in biodiversity conservation.

Conservation education and interpretation are recognized as important tools in winning public support for conservation. If the experience of the visitors to protected areas can be enriched, using a variety of appropriate media, they can return satisfied and become permanent supporters of the protected area in particular and wildlife in general.

The project, in collaboration with US-FWS under its Phase II programme, aims to develop interpretive plans and facilities for two areas viz. Panna national park in Madhya Pradesh and Corbett national park in Uttar Pradesh, in accordance with their specific field situation, potential and requirements. The two areas, though located in two different ecological regions, have similar management issues *vis a vis* user communities and have impressive inherent potential for development of interpretive facilities.

The interpretive prospectus will be prepared by WII faculty in consultation with the counterpart professionals from the US-FWS, whose long and varied experience in this field will be used to good effect in developing exhibits, audio-visuals, visitor centres, printed materials, signages, designing and laying out nature trails, etc. Such input from US-FWS experts would be required at the planning as well as the execution stages.

Before embarking on any field work, a team of US experts along with counterpart faculty members from WII made field visits to Melghat tiger reserve (Maharashtra) and Kanha national park (Madhya Pradesh) which have among the better park interpretive facilities in the country. This was followed by visits to Panna national park and Corbett national park. Immediately following these visits, a planning workshop was organized at WII in October 1997 where a strategy for launching the project and the future plan of action were worked out.

## **ORGANIZATION**

The most important body at the Wildlife Institute of India is its WII Society which is headed by the Union Minister for Environment and Forests. Among the other members are some State forest ministers, nominated Members of Parliament and Members of Legislative Assembly, officials from several central government ministries and departments, representatives from non-governmental organizations and eminent individuals. The V Annual General Meeting of the WII Society was held on 12 November 1997.

The actual functioning of the institute takes place under the direction of its Governing Body, presided over by the Secretary, Ministry of Environment and Forests. The XXXI Meeting of the GB took place on 21 October 1997.

#### **DEVELOPMENT COLLABORATION**

##### **UNDP**

The Government of India and UNDP have been collaborating since 1992 on a project aimed at "Strengthening wildlife management and ecodevelopment planning capabilities" within the Central and State wildlife agencies. As part of this, Management and Ecodevelopment Plans have been drawn up for 14 protected areas in the country by respective Field Planning Officers trained under the project.

During the year, following project evaluation last year, a Preparatory Assistance Mission was fielded to develop a proposal for the implementation of one or two model Ecodevelopment Plans. The Mission prepared a Sub-programme Support Document on Wildlife Protected Area Management which was subsequently revised. The project ended in June 1997, while the implementation proposal has been approved in principle by the Project Steering Committee of the UNDP.

#### **US - Fish and Wildlife Service**

US-Fish and Wildlife Service (US-FWS) has been collaborating with the Government of India on various wildlife conservation programmes since 1977. At the celebrations held in Washington on 23 September 1997, to mark 20 years of this collaboration, FWS made a mention of the outstanding support, assistance and cooperation received from a wide variety of individuals and organizations in its international programmes. Toward this, a special mention was made of the Wildlife Institute of India and a certificate presented in acknowledgement of WII's cooperation and significant contribution to the conservation and management of natural resources.

The collaborative project between WII and FWS, since 1989, has assisted the institute in upgrading its skills and tools in conducting its training and research programmes in biodiversity conservation. The Phase-I of the project completed in 1994. The Phase-II of the project (1995-2000) seeks to test the competence acquired as also to consolidate the gains of the first phase. This is being done through specific projects, broadly directed at management oriented biodiversity research or at developing laboratory or field technology and curriculum. (For details, see section on Research.)

##### **Others**

Individual project collaborations are also being conducted with the USDA Forest Service and the Ford Foundation, New Delhi. (More information in the section on Research.)

#### **SERVICES**

##### **Consultancy Projects**

The World Bank is funding several state forest departments through its Forestry Projects.

Under the wildlife and biodiversity components of these projects, some state forest departments, namely West Bengal, Maharashtra and Madhya Pradesh, have given WII the consultancy to carry out the research tasks on various aspects.

The following is the report on these consultancy projects for the year 1997-98 :

#### Management of elephant populations in West Bengal

This study on "Management of elephant populations in West Bengal for mitigating man-elephant conflicts" for the West Bengal forest department under its World Bank Forestry Project was carried out in two major elephant habitats in north Bengal and south Bengal. The objectives were to collect ecological information that would help set up conservation and management priorities for the elephants in these two regions, including the mitigation of the conflicts that exist between man and elephant.

During the project, seven elephants were radio-collared and studies were carried out on various aspects of their ecology and behaviour besides on the nutritional quality of their food, habitat viability, landuse planning, man-elephant conflict and enhancement of elephant esteem in people's perception. The study is complete and the final report was duly submitted to the West Bengal government in a presentation that included the World Bank representative and several distinguished forest and other personnel.

The report recommends landuse planning for different levels of elephant management. In areas where human population is high and agriculture economically important, elephant conservation must be

subordinate to human interest and safety. But elephant interest need not be forsaking totally and elephants need to be provided safe passage through these areas. Two such corridors were identified in north Bengal - Jaldapara to Bhutan via Titi forests; and between Buxa and Manas across the river Sankosh. On the other hand, habitats where elephant population is high and human population sparse, elephants must be given priority. As such, it is recommended that coordination committees be set up for demarcating the areas and developing respective management plans.

In order to reduce crop damage, fences are used. Physical barriers such as rubble wall can be tried where the materials are available locally and economically. In West Bengal, power fencing have also been used along forest and village interface boundaries. However, investigations into existing energised fencing systems revealed that most of the existing fences were ineffective because of technical or maintenance shortcomings. Actually electric fences can only work in situations where the pressures within and outside the fence are similar. It is often seen, fences used for crop protection are under more pressure from inside than outside, and hence liable to be breached. As such, in case of electric fencing, quick repair and effective maintenance are very important.



Elephant conservation in North Bengal.

Sushant Choudhury

Undoubtedly, the need for people's support is important for elephant conservation to succeed. For this, people need to be made more aware about the benefits of elephant conservation, but at the same time, their problems and interests cannot be overlooked. Community based programmes may be initiated for alternate employment and income generation in the more affected villages so that the loss suffered through crop depredation can be properly absorbed. This could be tied to elephant conservation efforts.

In this study, WII collaborated with the Regional Remote Sensing Service Centre, Kharagpur. From WII, it saw the involvement of seven faculty scientists.

#### Study on the management of rhinoceros in West Bengal

This is the second study consultancy conducted by WII for the West Bengal forest department under its World Bank funded Forestry Project. The task, undertaken in 1996, sought to do a complete study on the rhinoceros in two protected areas in West Bengal - Jaldapara wildlife sanctuary and Gorumara national park - which harbour the Indian great one-horned rhinoceros (*Rhinoceros unicornis*). The consultancy was given a six month extension upto September 1997, during which time the field work was completed.

The project addressed a number of managerial considerations such as status, population and current distribution of the rhinoceros across the two protected areas in West Bengal; did an assessment of vegetation composition, structure and rhino habitat; habitat utilization by the rhinos and the competing sympatric herbivores, both wild and domestic; and also assessed the current habitat management practices. The genomic DNA sequence variation in the rhino and its conservation implications were assessed for the first time in the wild rhinos in India. This was done in collaboration with the National Institute of Immunology (NII), New Delhi. The potential for wildlife tourism in the two protected areas was assessed and appropriate recommendations were made in terms of future strategies.

Apart from a number of suggestions on each of the above aspects, WII report has made ten specific recommendations for the management of the rhinos in the long term. The consultancy was completed toward end September with a review conducted by a committee set up for the purpose, followed by a workshop on this assignment, its findings and recommendations in October 1997. A large number of senior officers of the West Bengal forest department, University professors and NGO representatives attended the workshop. The final report was furnished to the West Bengal forest department in November 1997.

#### GEF-India Ecodevelopment Project

The GEF-India Ecodevelopment Project operating at seven selected PAs in the country assigned WII three consultancy tasks in its Project Pre-investment Facility (PPF) phase. The tasks were : (a) Development of a research strategy for PA management; (b) Development of strategies for updating the PA management plans; and (c) Environmental review of proposed project activities and investments.

During the previous year, site level workshops for developing site specific strategic research plans and evolving management planning strategy were organized in Periyar, Ranthambore, Pench and Gir protected areas, besides carrying out the environmental reviews at Gir and Ranthambore.

During the current reporting year, the progress was reviewed by the World Bank Mission in May 1997 followed by a National Consultation to review WII's task in the PPF phase, in August 1997. The consultation was attended by Additional IG (F-WL) at the Ministry of Environment and Forest, Director Project Tiger, the concerned Chief Wildlife Wardens and PA managers at the seven sites, among others. The separate reports on the three tasks, tabled by WII were accepted; and the participants deliberated on the proposed activities during the project implementation phase, viz. coordination of research and impact monitoring, preparation of management plans and their integration in the regional context and capacity building.

In September 1997, a site level workshop was held for Pench tiger reserve, so as to evolve research and management planning strategies there.

Based on the outcome of the various site level workshops and the National Consultation, the final report on the consultancy task of developing a strategy for updating management plan for the seven sites was prepared and submitted to the Government of India.

#### **Maharashtra consultancy project**

Under the World Bank aided Maharashtra Forestry Project, WII was selected to offer technical assistance to - (1) Develop monitoring and evaluation methodology for PA management and design a database to cater to the information needs of a biodiversity conservation programme; (2) Prepare an Action Plan for promoting wildlife tourism in Maharashtra. A planning workshop with the various interest groups for the three consultancies was held at Tadoba national park on 5-6 December 1997; and (3) Developing competency based training (CBT) package for frontline staff, including the cadre of Range Officers in wildlife management;

**Task 1** - During the year under reporting, work on designing a computerised and spatial database in the GIS domain at the PA level progressed well involving consultations with a large number of field officials.

**Task 2** - It included examining the wildlife tourism potential in Maharashtra state and suggesting probable options for its promotion. Accordingly, a perspective plan for wildlife tourism is to be developed which would include identification of revenue generation possibilities through tourism in PAs and ploughing back of this revenue for conservation. The role of public, private and local institutions/communities in ecotourism development was also required to be assessed. The task emphasized the need to examine the existing mass communication, publicity and extension techniques and suggest improvements therein for promotion of wildlife tourism and particularly for attracting

foreign tourists. This task finally aimed at preparing a wildlife tourism action plan for a period of 5 years, spelling out the details of investment with organizational requirements including linkages with other organizations like Maharashtra Tourism Development Corporation, Forest Department Corporation of Maharashtra, etc..

The Inception Report and the First Interim Report of the project have been submitted by the WII to the Maharashtra forest department.

**Task 3** - Following the planning workshop, it was decided to initiate work on CBT package. The specific tasks included (a) assessment of specialized training needs; (b) development of curricula and training literature in Marathi; (c) designing of one-month separate training package for Range Officers; and (d) help in conducting technical workshops on wildlife health, habitat improvement and wild animal census. A Counterpart Core Group (CCG) of 17 participants (past and present forest officers, NGOs) was constituted to steer the process in a participatory manner. The components of the CBT package and the process for its development were discussed and agreed to.

A second workshop for training need assessment, identification of areas of competency, setting performance criteria and standards was held at Sembadoh, Melghat tiger reserve on 4-7 February. The participants, besides the CCG members, included representatives of all cadres of frontline staff viz. tracker, mahawat and chara cutter, road barrier manning personnel, wireless operator, driver, forest guard, forester, AV technician and RFO. The participants worked in groups and developed, in all, 40 areas of competency with concerned performance criteria for each of such competency areas. The product was then reviewed and the components were sequentially put together as a first draft of a competency guide.

#### **Training package for frontline staff**

WII is developing a competency based training (CBT) package in wildlife management for frontline staff of the Madhya

Pradesh forest department, under the latter's World Bank aided Forestry Project. The draft competency based training package for the frontline staff prepared by WII has been accepted by the Madhya Pradesh forest department (MPFD). Since then, the infrastructure at the training school at Bandhavgarh has been significantly augmented to provide the necessary improved facilities. It was decided by MPFD to initiate training in selected modules for staff with experience in manning PAs. The identified resource persons from within MPFD who had actively participated in curriculum development process would administer the training. The regular courses using all modules for forest guards and foresters, are expected to start sometime in late 1998 or early 1999. WII will extend some advisory assistance in the matter of conducting training courses according to the new curriculum.

#### **Environmental impact assessment**

WII has an Environmental Impact Assessment (EIA) cell to conduct pre-project assessment studies towards the mandatory need for EIA of development projects, particularly with reference to their impact on wildlife values in the area. It also assists governmental and corporate agencies in conducting EIA studies, and extends technical support to several agencies and institutions in their capacity building in the field of Environmental Impact Assessment. In this regard, WII is represented on two expert committees (*Mining and River Valley Projects*) of the MoEF for environmental appraisal of projects received by it.

During 1997-98, the agencies that sought WII's professional services in EIA were - (1) Government of Mizoram on *The ecological assessment of the proposed airport site at Lengpui, Mizoram*; (2) Bharat Petroleum Corporation Limited on the *Impact assessment of Bina-Jhansi-Kanpur Pipeline Project on wildlife values*; and (3) Maharashtra State Road Development Corporation on *The ecological assessment of the proposed Mumbai-Pune Expressway*.

These studies have outlined the significant impacts of the proposed developments on the wildlife values and have led to the formulation of better preventive and effective mitigatory strategies to safeguard wildlife conservation efforts.

In response to the demands of the planners and decision makers for computer led support for EIA, the EIA Cell is currently developing a computer aided decision support system - EIA ~TRACK (EIA-Training Research Advisory and Consultancy Kit). The first of the four modules under this has already been developed. With this, WII will become a pioneer in offering an integrated computer support system for incorporating legislative, administrative, scientific, technical and procedural considerations that have been currently lacking in the overall framework for EIA in India.

#### **Other consultancies**

\* Over the last few years, there has been a sharp fall in the arrival of Siberian cranes for wintering in India. Concerned at this, in 1994, the Indian government in association with the International Crane Foundation (ICF) decided to re-establish a population through restocking of captive-bred Siberian cranes obtained from breeding centres in Germany and the USA. Since then several attempts have been made to bring-up the captive-bred cranes in Keoladeo Ghana national park in Bharatpur (Rajasthan), but without much success.

This year too four captive-bred Siberian cranes were brought from the USA in specially designed wooden cages for release in Bharatpur. WII was involved in keeping these under initial quarantine, releasing them in the national park and in their subsequent health monitoring. The operation has been successful, except that one of the cranes, a female, died in August 1997. From WII, Dr PK

Malik, Scientist SE and incharge Wildlife Health, with the help of the Indian Wildlife Health Cooperative Centre (Northern region), Hissar Veterinary College (Haryana) conducted the detailed post-mortem and disease investigation of this fatality. However, since the bird was discovered at least two days after its death and the carcass was autolysed, no cause of death could be ascertained. WII is now in the process of initiating a systematic study of contaminants and diseases of avifauna in the Keoladeo Ghana national park with particular reference to the released Siberian cranes.

At the request of the Madhya Pradesh forest department, WII investigated the death of five tigers in Madhav national park and three tigers and one leopard in Van Vihar national park. The diagnosis was done in Jabalpur and Bhopal by Dr PK Malik with the assistance of the Indian Wildlife Health Cooperative Centre (IWHCC - Central region), Jabalpur College of Veterinary Sciences. *Feline-panleukopaenia* was diagnosed as the cause of the mortalities.

*Feline-panleukopaenia* is a highly infectious viral disease among felids. In the Serengeti national park (Tanzania) about 800 lions have succumbed to this disease, and in Japan in 1994, 19 lions have been reported to die from it. In India, although the disease has not been specifically reported in the wild so far, there have been several reports of mortality in captive and free ranging animals showing similar clinical symptoms. However, this was the first time that this disease was actually diagnosed based on histopathological investigations.

IWHCC's (Central region) assistance was sought to procure the vaccine against this viral disease and all the tigers and leopards at Van Vihar and

Madhav national parks were vaccinated. Sick animals were also treated and further mortality checked. A second booster vaccination, followed by annual vaccination has also been conducted. It is felt necessary to initiate a systematic investigation of the disease of wild and captive carnivores at the earliest so as to take proper prevention and control measures against important diseases which may cause high mortality among these wild animals.

Under the Uttar Pradesh forestry project, two assignments were completed -(a) *Selection of NGO motivators as spearhead team*; and (b) *Training of spearhead team*. The objective was to strengthen the management of protected areas in Uttar Pradesh through the involvement of local communities. In October 1997, a training workshop for microplanning was conducted for the spearhead teams from Corbett, Dudhwa and Chambal; and in December 1997, a consultative meeting was held at WII. Three model microplans were prepared for the above three sites.

Under the World Bank funded Madhya Pradesh Forestry Project, the MP state forest department (MPFD) invited WII to develop a *Bibliography of literature on wildlife* pertaining to Madhya Pradesh. In response, WII submitted technical and financial proposals on the subject to the MPFD, which were granted approval by the latter in March 1998. WII has accordingly initiated action on signing of the contract and commencement of work.

Dr NPS Chauhan looked into the problem of damage to the dhak plantations by wildlife in Agodha, Mainpuri range, Uttar Pradesh. On the basis of information collected it was assumed that the damage was mainly by porcupines or the bandicoot rats.

Remedial measures to reduce the damage were suggested.

Dr NPS Chauhan was invited for discussions and to suggest measures to mitigate the problem of feral cattle in the Dhule forest division, Deopur.

#### Teaching inputs

**MSc course**, University College London, UK - Dr AJT Johnsingh, Head (Biology); on *Joint Forest Conservation*.

Indira Gandhi National Forest Academy and State Forest Service, Dehra Dun (Uttar Pradesh) - Dr Asha Rajvanshi, Scientist SE (EIA); on *Environmental Impact Assessment*;

**MSc Forestry Programme**, ICFRE Deemed University, Dehra Dun - Dr PK Mathur, Scientist SF (Management) on *Concepts, principles and management issues relevant to biodiversity conservation, habitat management, particularly grazing, fire and water management in wildlife areas*; and Dr Asha Rajvanshi, Scientist SD (Ecodevelopment) on *Conservation and Development*.

**Refresher Course for SFS officers**, State Forest Service College, Dehra Dun. Dr PK Mathur, on various aspects of *Biodiversity conservation, grassland management practices and management planning process*; Dr Asha Rajvanshi, on *Forestry and Rural Development*.

State Forest Service College, Dehra Dun and UP State Administrative Training Institute, Nainital (Uttar Pradesh) - AK Bhardwaj on *Ecodevelopment case studies for Periyar tiger reserve and Rajaji national park* highlighting the issues related to ecodevelopment.

**Training course in Forestry Extension**, ICFRE, Dehra Dun - Bitapi C Sinha, Scientist SD

(Extension) on *Audio-visual aid in forestry extension*.

**Environment and Nature Conservation Workshop for Army Officers**, at RIMC, Dehra Dun (January 1998) organized by the local army command; Dr BK Mishra, Scientist SE (Extension) assisted in planning and designing course curriculum besides giving a lecture on *Biodiversity Conservation* aspect; Bitapi C Sinha, on *The need for creating conservation awareness among para-military personnel*.

Training course on *Environmental Management of Mine Areas*, for senior executives of the Steel Authority of India; organized by ICFRE, Dehra Dun - Dr Asha Rajvanshi on, *Ecological assessment of mineral extraction projects*.

**IFS Officers of the III Induction Course**, IGNFA, Dehra Dun - Dr Ruchi Badola on *Ecodevelopment* and AK Bhardwaj on different aspects of ecodevelopment - *Concepts of ecodevelopment; Conservation development linkages; Values and beliefs for ecodevelopment; Community participation in ecodevelopment; Stakeholders in conservation planning*.

#### FACILITIES

#### ENVIS CENTRE ON WILDLIFE & PROTECTED AREAS

An important development for WII this year was its declaration as an ENVIS Centre of the Ministry of Environment and Forests for general matters concerning "Wildlife" and specifically those related to "Protected Areas". The Centre was set up in September 1997 with the following objectives : (i) To establish a data bank on information related to wildlife and wildlife protected areas, and thereby build up a repository and dissemination centre for information on wildlife sciences; (ii) To promote national and international cooperation, and exchange of wildlife related information; and

(iii) To provide decision-makers at the apex level with information related to conservation and development.

In pursuance of the above objectives, the Centre seeks to (a) build up information storage, retrieval and dissemination capabilities for subjects related to wildlife science; (b) establish linkages with national and international information sources in wildlife conservation and management; (c) respond to user queries by supplying substantive information in the form of original or photo-copies of published reports, documents, extracts, research papers, etc., and other unpublished and analyzed information as far as possible; (d) maintain links with other ENVIS Centres in the country; and (e) publish periodic newsletter/bulletin dealing with the concerned subject areas.

The first issue of the ENVIS (Wildlife and Protected Areas) bulletin, on the subject Elephant, was published in March 1998. The bulletin, a non-priced biannual publication issued under the INFOTERA Programme of the UNDP is now proposed to have an Internet edition as well.

#### COMPUTER CENTRE

The Computer Centre at WII, equipped with the latest in computer hardware and software is also among the best in the country in the field of wildlife studies. The Centre services the training, research, database, cartography including GIS, digital image processing of remotely sensed data and desktop publishing needs of the institute, besides conducting training in computer application for the officers trainees of the diploma, certificate and other courses and workshops, and for the faculty members, researchers, students and the staff at the institute.

During 1997-98, the computer facilities at the institute were augmented with the procurement of 11 Pentium systems and two portable Notebooks, two dot matrix printers, one colour laser printer (Xerox X 4920 plus) and one A4 size colour scanner (Arctec Viewstation AT 3). With this, WII is now

capable of producing desktop jobs in colour as well. An external CD-ROM drive was also procured to enable loading of software and data available on CDs to existing PCs in the institute which are not otherwise equipped with the CD-ROM drive. The existing LAN operating system software Novell Netware 3.11 was upgraded to Novell Intranetware which has additional and improved features. WII has applied to Videsh Sanchar Nigam Ltd (VSNL) for leased line internet connectivity through the microwave link at 64 Kbps bandwidth. For this, a CISCO 2514 router is being procured to provide internet services on our LAN setup, and the necessary Netscape software packages for the internet are also being bought. It is also planned to have a mail server for sending/receiving Email. The Computer Centre is also in the process of developing a WII home page on the internet. In view of all such development, the existing LAN fileservers and nodes would be suitably upgraded to meet the ever increasing demands for disk space for data storage and to operate Windows based software packages.

#### LIBRARY AND DOCUMENTATION CENTRE

Information is a vital resource for research and developmental activities. Scientists and researchers perpetually need information on the work being done or already done elsewhere related to their own field of study, to avoid repetition and to corroborate their work. Such information made available to the right reader at the right time, in the right form results in more efficient and fruitful research and development programmes. This makes the libraries a mandatory and inseparable part of any organization.

The Library and Documentation Centre (L&DC) at WII, starting from a modest collection of about 2,500 books and 40 journals in 1986, is today among the most advanced in the field of biodiversity conservation and management. Its total collection now stands at about 16,000 books,

7400 reprints, 6732 toposheets, 108 standards and 295 theses and dissertations, besides 314 national and international journals which are received regularly. The additions made in 1996-97 included 1189 books, reports, proceedings, theses, dissertations, etc. and 850 reprints.

The L&DC provides the following : Current Awareness Service (CAS), Retrospective Search Service (RSS), Bibliographical Services on demand and anticipation, Inter Library Loan Services among local libraries, Reprographical Service, and Document Delivery Service. These are provided to the inhouse scientists and researchers as well as to the outsiders.

The L&DC has also created a Database of Thesaurus of wildlife terms for uniformity in retrieval and to achieve higher precision. Besides, a database of Indian Wildlife Abstract of articles published on India has been created and is being maintained regularly. A CD-NET Server has been installed in the Centre for multiple CD-ROM databases search. The L&DC also has a sales counter where the various publications and other products of the institute are sold.

The following were the services provided during the year under reporting : Photocopy pages 1,63,639; Books issued 3752; Retrospective searches from L&DC databases 10,057; CD-ROM searches 100; Inter-library loan 15; Reference queries 230; Visitors attended 600; and Document procurement in process (reprints) 22.

#### LABORATORY

The Laboratory at WII is broadly divided into three sections - *Research, Teaching and Forensic*. In the *Research laboratory*, the samples collected from field are analyzed, e.g. protein estimation of plant samples, fat estimation, energy value determination, pH value, carnivore scat analyses, herbivore faecal pellet analyses, etc; in the *Teaching laboratory*, the practicals for the institute's

various courses are conducted; while the forensic laboratory, started this year conducts identification tests to support various law enforcement agencies.

During 1997-1998, 490 plant samples collected from Royal Bardia national park (Nepal), 65 plant samples from Corbett national park (Uttar Pradesh), 52 plant samples from Jodhpur (Rajasthan) and 60 plant samples from Assam were analyzed for acid detergent fibre (ADF), acid detergent lignin, acid insoluble ash, neutral detergent fibre (NDF), calorific value, tannin, nitrogen and fat estimation. Besides, 120 plant samples collected from Rajaji national park were analyzed for ash content, crude protein and NDF; 50 plant samples from Tadoba national park (Madhya Pradesh) were tested for calorific value, ash content, ADF, lignin and acid insoluble ash; 64 plant samples collected during the West Bengal Elephant project were analyzed for ADF, lignin, ash, calorific value and tannin. Also, 15 samples collected from Pench tiger reserve were analyzed for crude protein and calorific value.

On the faunal side, 75 leopard scats from Kedarnath wildlife sanctuary and 50 tiger scats from Panna national park were analyzed for the identification of prey remains.

The various techniques for the estimation of forage quality, diet estimation from herbivore faecal matter, carnivore scat analysis, plant sample analytical techniques and radio-telemetry were demonstrated in the *Teaching laboratory* for diploma and certificate courses and to the MSc students. A permanent meteorological station has been installed in the Laboratory to measure the daily maximum and minimum temperatures, relative humidity and rainfall. The stock inventory information of permanent equipment in the Laboratory, and the status of loaned equipments to the users have been computerised.

At the *Forensic laboratory*, 40 cases were received for identification.

## HERBARIUM

The Herbarium at WII houses angiosperms, gymnosperms and fern samples collected by students, researchers, trainees and faculty members during their field trips to the various protected areas all over the country.

During the reporting period, the major localities from where plants were received for identification, labelling and further processing were Pakhui wildlife sanctuary (Arunachal Pradesh), Kalakad-Mundanthurai tiger reserve (Tamil Nadu), Great Himalayan national park (Himachal Pradesh) and Pachmarhi national park (Madhya Pradesh). With these, the total number of specimens in the Herbarium's collection has reached to about 15,000. Curation and maintenance of the Herbarium and preparation of plant databases for various protected areas are in progress.

## AUDIO-VISUAL UNIT

Catering to the requirements of academics and training, the Extension faculty of the institute has an Audio-Visual Unit which maintains a slide library, video and film library, video cameras and accessories, slide projectors, overhead projectors, 16 mm film projector. Facilities also exist for computer and video aided panoramic projections which are extensively used as teaching aids and in workshops, seminars and conferences.

During 1997-98, about 500 colour transparencies and video film were added to the AV Unit's collection. A public address system, a more powerful amplifier along with speaker columns, stereo deck, audio mixer and cordless mikes were procured to augment the Unit's capability in catering to a large assembly.

The AV Unit produced a training film entitled "Signatures in the Wild" in two parts, targeted at training of front line staff and nature guides in protected areas. The unit also made a film "Smriti" of the India's Golden Jubilee reunion of senior foresters at the Indira Gandhi National Forest Academy, Dehra Dun in

March 1998. A dual projector slide tape programme titled "Reaching out to our neighbours, promoting ecodevelopment closer home" was produced inhouse by the unit, to record and document the ecodevelopment initiatives undertaken by the institute with the local village communities.

## PUBLICATIONS

As part of its information dissemination programme, WII brings out technical reports, workshop proceedings, field manuals, etc. from time to time. During 1997-98, the first issue of the "Envis (Wildlife and Protected Areas)" biannual bulletin was published. The issue provided reading material and extensive bibliography on the Asian elephant in India. Also published was "Partners in Conservation", the report on the first phase of the WII-USFWS collaboration (1989-94). Regular publications included WII Newsletter (Volume 4, Nos 2, 3&4) and the Annual Report 1996-97.

## SPORTS

The 6th All-India Forest Sports Meet was held this year at Bangalore on 7-11 January 1998, in which 31 states, UTs and institutions participated. WII's delegation comprised 28 members participating in cricket, lawn tennis, table tennis, carrom, rifle shooting, billiards and badminton, besides taking part in the quiz competition and cultural programme at the meet. The delegation bagged two silver medals (women's singles table tennis and quiz competition) and two bronze medals (cricket and men's singles lawn tennis). Other creditable performances included, 4th position in rifle shooting and men's veteran singles lawn tennis, and reaching the semi-finals in men's singles and doubles table tennis.

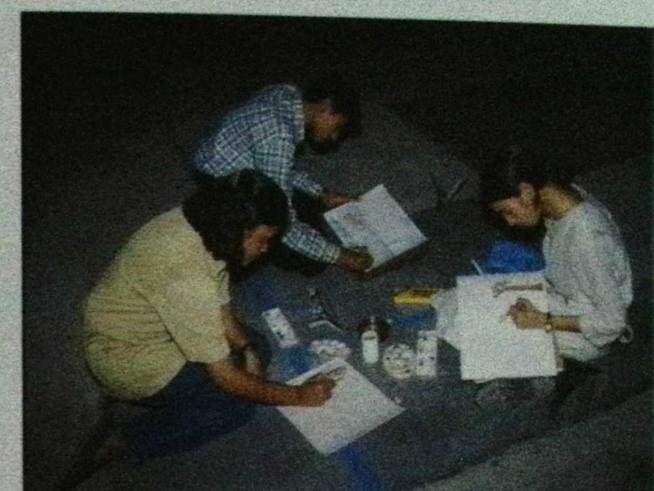
The WII cricket team won the annual cricket tournament organized by the Central government Employees Welfare Association, Dehra Dun at the Survey of India, Dehra Dun grounds.

## WORLD ENVIRONMENT DAY

On World Environment Day, i.e. 5 June 1997, Dr BK Mishra, Scientist SE (Extension) and Pratap Singh, Scientist SE (Extension) organised a nature excursion for the children of WII campus. Altogether 51 children participated in this and learnt the basics of bird watching. Thereafter, the children pursued this hobby on a regular basis and, with the help of researchers and students of the institute, prepared a list of birds in the WII campus and its surroundings. They submitted reports on this which were displayed in the WII library.

## WILDLIFE WEEK

During the 50th anniversary of India's independence, the wildlife week (first week of October 1997) was celebrated by the institute in a befitting manner. An environmental quiz competition was organized in three Kendriya Vidyalaya (Central Schools) - at FRI, IMA and ONGC in Dehra Dun, in which altogether 250 children in the age group 10-14 years participated. Based on their performance in the competition, 22 children were selected for a one-day field visit to the Rajaji national park where, through simple activity based games and demonstrations, the children were introduced to the park's values and the fragile nature of the ecosystem. The children were also exposed to the lifestyles of the local residents, the related conservation problems, and the ecological impacts of development projects.



Children participating in drawing competition, organised by WII during VIRASAT '97.

Vinod Verma

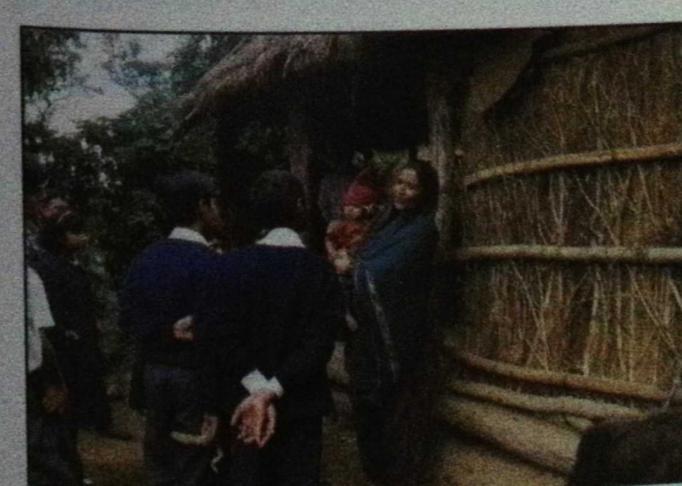
During the week, the residents of the Chandrabani village were also motivated to clean the garbage in their village premises. Both these programmes were coordinated by Dr BK Mishra, Scientist SE (Extension).

## OTHERS

Like the previous year, WII participated in VIRASAT '97, a fair organized by SPIC MACAY in Dehra Dun in April 1997. The institute put up a photo exhibition on the theme of Himalayan Biodiversity, and popular wildlife films were screened for the public every evening at the two-week long fair. Drawing and environmental quiz competitions were also conducted for school children, in which a total of 81 students from nine schools participated. The winners were suitably awarded with prizes and certificates.

## CAMPUS DEVELOPMENT

The works completed during the year under reporting included - construction of road pavement in Block IV, supply and installation of 11 KV transformer including cable for it and other accessories, provision of a foundation column and related civil and electrical works besides erection of pre-engineered building for accommodation for the institute faculty and staff. Work was commenced and is under progress on the construction of kitchen and dining hall in the New Hostel Block besides the construction of an additional Modular Institutional Block which has been approved and would start shortly.



Winners of the environmental quiz competition, organised during Wildlife Week at Rajaji National Park. S. Wilson

### PERSPECTIVE 1998-99

The development of the institute is taking place at a rapid pace as a result of which an urgent need is being felt for more space. There is a proposal to have an additional modular block to house some of the increasing institutional activities. Funds for this have now been approved, and work on its construction is expected to begin soon.

While all regular short and long term courses and workshops held this year will be conducted next year as well, some of the new subject areas in which these are planned to be held are :

- \* Wetland research methods
- \* Documentation of ecodevelopment initiatives
- \* Chemical immobilization of wild animals and radio telemetry
- \* Population estimation of wildlife
- \* Habitat management and evaluation techniques
- \* Workshop on wildlife damage problems and control
- \* Management of coastal protected areas
- \* Grassland management in Indian protected areas

A workshop is also proposed to be held for field managers from UNDP sites on - Management skills for biodiversity conservation.

Networking with similar organisations and institutions in other countries which are actively involved in protected area management, training programmes and

applied wildlife research for biodiversity conservation is planned with the help of UNESCO.

WII's links with the states on effective protected area management will continue to strengthen, particularly in those states where World Bank supported Forestry Projects are being conducted. As part of the Maharashtra Forestry Project, WII will complete its tasks on monitoring, wildlife tourism and training. The institute will also develop a bibliography of wildlife literature in context of Madhya Pradesh, for the MP forest department under a similar consultancy programme.

A mid-term evaluation of the projects being conducted as part of WII's IIInd phase collaboration with US Fish and Wildlife Service and US Forest Service is scheduled during the year.

A major development for the institute, expected to materialize soon, is getting an internet connectivity, which would be made available at all lan nodes. While this will open up a world of information to the WII inmates, it'll also help the institute in communicating its message worldwide. The institute will have a home page on the worldwide web, and major information and publications of the institute will be placed therein.

On the publications front, besides the regular Newsletter and ENVIS bulletin, the earlier manuals and guidelines for power fencing and for ecodevelopment planning will be revised. A couple of monographs and completed research reports will also be published. A major publication being planned is the "State of India's Wildlife".

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Singh RK and S Chowdhury (In press) - **Effect of mine discharge on the riverine habitat use pattern of elephants *Elephas maximus* and other mammals in Singhbhum forests, Bihar**; *Journal of Environmental Management*.

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## Ph.D. DEGREE

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## MEMBERS

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Wildlife Institute of India,  
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**DEHRA DUN - 248 001**
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**(West Bengal)**
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Central Zoo Authority  
Bikaner House, Annexe IV  
Shahjahan Road,  
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Research & Education (ICFRE)  
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10. Dr. A.J.T. Johnsingh  
Head, Wildlife Biology Faculty  
Wildlife Institute of India  
Chandrabani,  
**DEHRA DUN - 248 001 (U.P.)**
11. Sh. V.B. Sawarkar, Head,  
Wildlife Management Faculty  
Wildlife Institute of India  
Chandrabani,  
**DEHRA DUN - 248 001 (U.P.)**
12. Sh. Ujjwal Bhattacharya  
Head, Wildlife Extension Faculty  
Wildlife Institute of India  
Chandrabani,  
**DEHRA DUN - 248 001 (U.P.)**
13. Dr. Ravi Chellam  
Research Coordinator  
Wildlife Institute of India  
Chandrabani,  
**DEHRA DUN - 248 001 (U.P.)**
14. Dr. Ravi Chellam  
Research Coordinator  
Wildlife Institute of India  
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**DEHRA DUN - 248 001 (U.P.)**

15. Sh. S.K. Mukherjee  
*Member-Secretary*  
 Director, Wildlife Institute of India  
 Chandrabani,  
**DEHRA DUN - 248 001 (U.P.)**  
**(Five CWLWs on rotational basis)**

16. Dr. R.D. Jakati, IFS  
 Chief Wildlife Warden,  
 Government of Haryana  
 Forest Complex-C-18, Sector-6,  
**PANCHKULA - 134 109**  
**(Haryana)**

17. Shri A.M. Ao, IFS  
 Chief Wildlife Warden,  
 Government of Nagaland,  
**DIMAPUR (Nagaland)**

18. Shri Richard D'Souza, IFS  
 Chief Wildlife Warden,  
 Govt. of Andaman & Nicobar Islands  
 Post Office : HADDO,  
**PORT BLAIR - 744 102**  
**(Andaman & Nicobar)**

19. Shri Sujit S. Choudhury, IFS  
 Chief Conservator of Forests &  
 Chief Wildlife Warden,  
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 Juanta House, 3rd Floor,  
**PANAJI - 403 001**  
**(Goa)**

20. Shri Avani Kumar Verma, IFS  
 Addl. P.C.C.F. (Wildlife) &  
 Chief Wildlife Warden,  
 Government of Karnataka,  
 Aranya Bhawan, 18th Cross  
 Malleshwaram,  
**BANGALORE - 560 003**  
**(Karnataka)**

**(Special Invitees)**

21. Shri Gurmit Singh  
 Chief Wildlife Warden &  
 Director, M.C. Zoological Park  
 Chhat Bir, Government of Punjab,  
 SCO No. 83940/22-A  
**CHANDIGARH**

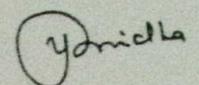
22. Dr. K. Raghunathan, IFS  
 Director Animal Husbandry-cum-  
 Chief Wildlife Warden  
 Government of Pondicherry  
**PONDICHERRY**

23. Dr. A.K. Ambasht, IFS  
 Chief Wildlife Warden,  
 Daman & Diu,  
**DAMAN**  
**(Daman & Diu)**

24. Shri R.K. Goel  
 Conservator of Forests and  
 Chief Wildlife Warden  
 Government of Delhi  
 Kamla Nehru Ridge  
**DELHI 110 007**

**AUDIT CERTIFICATE**

I have examined the Receipts and Payments Account/Income and Expenditure Account for the year ended 31 March, 1998 and the Balance Sheet as on 31 March, 1998 of the Wildlife Institute of India, Dehradun. I have obtained all the information and explanations that I required and subject to the observations in the appended Audit 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 Wildlife Institute of India according to the best of information and explanations given to me and as shown in the books of the organisation.



Principal Director of Audit  
 Scientific Departments

Place : New Delhi  
 Date : 22-12-98

Wildlife Institute of India

**Balance Sheet as on 31-3-98**

| <b>FUNDS &amp; LIABILITIES</b>                                             |                     | <b>As on 31-3-97</b> | <b>Additions during 97-98</b> | <b>As on 31-3-98</b>                        |
|----------------------------------------------------------------------------|---------------------|----------------------|-------------------------------|---------------------------------------------|
| Excess of income over exp                                                  | 19234078.68         | 13478328.31          | 32712406.99                   | LAND                                        |
| Pension Fund                                                               | 3184865.25          | 670582.00            | 3855447.25                    | TREES                                       |
| GP Fund                                                                    | 4355297.03          | 775835.00            | 5131132.03                    | Avenue Plantations                          |
| Amount Capitalised                                                         | 184688013.03        | 10365975.00          | 195053988.03                  | Campus Development                          |
| CGEGIS Refund                                                              | 16423.90            | 0.00                 | 16423.90                      | Lab equipment                               |
| Ernest Money Deposit                                                       | 53600.00            | -53600.00            | 0.00                          | Furniture & Fixtures                        |
| Security Deposit                                                           | 993564.95           | -159234.00           | 834330.95                     | Vehicle                                     |
| Withheld Amount                                                            | 22113.00            | -2720.00             | 19393.00                      | Library books                               |
| Receipts from Rajaji NP for elephant action plan workshop held in June, 96 | 18793.00            | -18793.00            | 0.00                          | Office Equipment                            |
| Payment received for research equipment for Siberian Crane Project         | 203000.00           | -78988.00            | 124012.00                     | Camp Equipment                              |
| Project Cost (Shri Pratap Singh)                                           | 88590.30            | 0.00                 | 88590.30                      | Photographs & Photos Materials and supplies |
| Double Payment to be refunded                                              | 190250.00           | -190250.00           | 0.00                          | Educational films                           |
| To Advance receipt of printing of Eco Dev Project                          | 0.00                | 500000.00            | 500000.00                     | Journals & Periodicals                      |
| To advance for conducting zoo management course                            | 0.00                | 500000.00            | 500000.00                     | Training equipment                          |
| <b>Carried Over</b>                                                        | <b>213048589.14</b> | <b>25787135.31</b>   | <b>238835724.45</b>           |                                             |

**Brought Over**

|              |             |              |                     |
|--------------|-------------|--------------|---------------------|
| 213048589.14 | 25787135.31 | 238835724.45 | <b>Carried Over</b> |
|--------------|-------------|--------------|---------------------|

**184277850.71**

|                                       |            |            |            |
|---------------------------------------|------------|------------|------------|
| DG Set                                | 715126.00  | 0.00       | 715126.00  |
| EPABX                                 | 1176484.00 | 0.00       | 1176484.00 |
| AC Plant                              | 2597452.00 | 0.00       | 2597452.00 |
| Advance for expences (Trg.)           | 45830.00   | 181250.00  | 181250.00  |
| Advance to staff                      | 935931.21  | -106448.21 | 829483.00  |
| Loan & advance to staff               | 1022654.20 | -14185.00  | 326642.00  |
| Staff quarters                        | 3175520.00 | 0.00       | 3175520.00 |
| Road & culvert                        | 1333970.00 | 390141.00  | 1724111.00 |
| Tennis court                          | 530852.32  | 0.00       | 530852.32  |
| Auditorium                            | 856592.00  | 0.00       | 856592.00  |
| Closing stock of steel & cement       | 1093059.90 | 745000.00  | 1835559.90 |
|                                       | -2500.00   | -2500.00   |            |
| Grant in aid accrued but not received | 0.00       | 1850000.00 | 1850000.00 |

|                                 |                     |             |                   |
|---------------------------------|---------------------|-------------|-------------------|
| Closing balance (Training)      | 0.00                | 0.00        | 2469386.40        |
| Closing bank balance            | 0.00                | 0.00        | 8686337.04        |
| Closing cash balance            | 0.00                | 0.00        | 99308.70          |
| F.D.R                           | 0.00                | 0.00        | 1300000.00        |
| <b>GPF</b>                      | <b>0.00</b>         | <b>0.00</b> | <b>1131132.03</b> |
| Bank balance                    | 0.00                | 0.00        | 1000000.00        |
| F.D.R                           | 0.00                | 0.00        | 3000000.00        |
| Kisan Vikas Patra PENSION FUND: |                     |             |                   |
| Bank balance                    | 0.00                | 0.00        | 1005447.25        |
| FDR                             | 0.00                | 0.00        | 1400000.00        |
| Kisan Vikas Patra               | 0.00                | 0.00        | 1450000.00        |
| <b>Carried Over</b>             | <b>234327003.55</b> |             |                   |

**Brought Over**

|                                        |                    |                     |                     |
|----------------------------------------|--------------------|---------------------|---------------------|
| <b>213048589.14</b>                    | <b>25787135.31</b> | <b>238835724.45</b> | <b>Brought Over</b> |
| Training cost accrued but not received | 798735.00          | 365000.00           | 635000.00           |
| <b>CONSULTANCY PROJECTS</b>            |                    | <b>-528735.00</b>   |                     |
| <b>CLOSING BALANCE</b>                 | <b>0.00</b>        | <b>0.00</b>         | <b>3873720.90</b>   |
| <b>GRAND TOTAL</b>                     |                    |                     | <b>238835724.45</b> |

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

sd/-  
(S.S. OBEROI)  
Finance Officer

**Brought Over**

|                                        |             |                   |                     |
|----------------------------------------|-------------|-------------------|---------------------|
| Training cost accrued but not received | 798735.00   | 365000.00         | 635000.00           |
| <b>CONSULTANCY PROJECTS</b>            |             | <b>-528735.00</b> |                     |
| <b>CLOSING BALANCE</b>                 | <b>0.00</b> | <b>0.00</b>       | <b>3873720.90</b>   |
| <b>GRAND TOTAL</b>                     |             |                   | <b>238835724.45</b> |

sd/-  
(SUSHANT CHOUDHURY)  
Registrar

| RECEIPTS                                            | Wildlife Institute of India<br>Receipt and Payment Account for the year 1997-98 |                    |                   |
|-----------------------------------------------------|---------------------------------------------------------------------------------|--------------------|-------------------|
|                                                     | PLAN                                                                            | NON PLAN           | TOTAL             |
| By Salaries                                         | 9012000.00                                                                      | 5207694.00         | 14219694.00       |
| 128382.70                                           | 150000.00                                                                       | 86202.00           | 236202.00         |
| 13677204.92                                         | 0.00                                                                            | 24927.00           | 24927.00          |
| 848281.90                                           | 715300.00                                                                       | 0.00               | 715300.00         |
| 45050000.00                                         |                                                                                 |                    |                   |
| To Wages                                            | 520000.00                                                                       | 158576.00          | 678576.00         |
| 2057516.00                                          | 1650007.00                                                                      | 0.00               | 1650007.00        |
|                                                     | 0.00                                                                            | 26815.00           | 26815.00          |
| 528735.00                                           |                                                                                 |                    |                   |
| To Training cost received during the year           |                                                                                 |                    |                   |
| Outstanding Training cost received during year      | 106448.21                                                                       | 125385.00          | 277385.00         |
|                                                     |                                                                                 |                    |                   |
| To advance for expenses (staff)                     |                                                                                 |                    |                   |
| Other Receipts (training)                           | 1810614.50                                                                      | 0.00               | 18793.00          |
| Outstanding advance for expenses received(training) | 3601757.50                                                                      | 990202.50          | 2800817.00        |
|                                                     | 45830.00                                                                        | 0.00               | 112501.00         |
|                                                     |                                                                                 |                    |                   |
| To Interest-Bank Account (training)                 |                                                                                 |                    |                   |
| To amt. received for printing (PANC/ECO/DEV REPORT) | 500000.00                                                                       | 0.00               | 112380.00         |
|                                                     |                                                                                 |                    |                   |
| To Zoo course                                       | 500000.00                                                                       | 0.00               | 146999.00         |
|                                                     |                                                                                 |                    |                   |
| To interest credited by bank                        | 324742.00                                                                       | 0.00               | 46388.00          |
|                                                     |                                                                                 |                    |                   |
| To panel interest                                   | 9094.00                                                                         | 421300.00          | 250045.00         |
|                                                     |                                                                                 |                    |                   |
| To G.P.F.                                           |                                                                                 | 1005000.00         | 650004.09         |
|                                                     |                                                                                 |                    |                   |
| Opening balance                                     | 355297.03                                                                       | 50160.00           | 50160.00          |
| FDR                                                 | 1000000.00                                                                      | 150027.00          | 150027.00         |
|                                                     | 3000000.00                                                                      | 0.00               | 53600.00          |
|                                                     |                                                                                 |                    |                   |
| Receipts during the year                            | 1797491.00                                                                      | 0.00               | 2720.00           |
| <b>Carried Over</b>                                 | <b>73576429.26</b>                                                              | <b>16014102.50</b> | <b>8317970.59</b> |
|                                                     |                                                                                 |                    |                   |
| By refund of with held amount from contractor bills |                                                                                 |                    |                   |
|                                                     |                                                                                 |                    |                   |
|                                                     |                                                                                 |                    |                   |

**Brought Over**  
TO PENSION FUND:

|                                |           |
|--------------------------------|-----------|
| Opening balance                |           |
| FDR                            |           |
| Kisan Vikas Patra              |           |
| Receipts during the year       |           |
| To Loans and Advances to staff |           |
| Computer advance               | 10318.00  |
| Fan advance                    | 3867.00   |
| To M.Sc course fee             | 14185.00  |
| Nanda Devi Biosphere Project   | 489230.00 |
| 70000.00                       |           |
| TO MISC. RECEIPTS:             |           |
| Guest House Rent               | 148194.00 |
| Recovery of lost items         | 1265.00   |
| H.L. fee                       | 125286.00 |
| Penalty                        | 147006.00 |
| Bank rent                      | 27600.00  |
| Forfeited amount(PCL)          | 50000.00  |
| Interest on conv. Adv.         | 3751.00   |
| Sale of WII Products           | 151119.00 |
| Bus charges                    | 72045.00  |
| To Cement                      | 2500.00   |

**CONSULTANCY PROJECT A/C:**

|                                |             |
|--------------------------------|-------------|
| Opening balance                | 2270334.00  |
| Receipts during the year       | 8570546.40  |
| INSTITUTIONAL CHARGES:         |             |
| Grant for status survey for    | 70000.00    |
| Asian elephant                 |             |
| XV III Diploma course          | 129700.00   |
| XIII Diploma course            | 95232.00    |
| Siberian Crane Project         | 64000.00    |
| DCF(WL) Bharatpur              |             |
| 70 ARS/SAARC Contribution      | 23200.00    |
| National Geographic Film       | 36246.00    |
| One week Eco Dev. course       | 75000.00    |
| WB Forestry Project            | 436000.00   |
| WBFP Rhino project             | 199000.00   |
| EDITOR AT LARGE -              |             |
| - DAVID QUANMEN                | 7931.00     |
| Special dip course (Sri Lanka) | 170805.00   |
| ICIMOD 1st Inst.               | 43440.00    |
| from A/c no 8                  | 500000.00   |
| Carried Over                   | 35435432.50 |
|                                | 10259146.59 |
|                                | 70262946.23 |

**Brought Over**

|                                            |             |
|--------------------------------------------|-------------|
| By Refund of Security Deposit              | 16014102.50 |
| Contractor bills                           | 0.00        |
| By Uniforms                                | 0.00        |
| By Entertainment charges                   | 7586.00     |
| By Festival advance                        | 25625.00    |
| 6770.00                                    | 25625.00    |
| By Conveyance advance                      | 0.00        |
| 318256.00                                  | 318256.00   |
| By House Building advance                  | 0.00        |
| 1616.00                                    | 1616.00     |
| By audit fee                               | 0.00        |
| By Landscaping                             | 487337.00   |
| By stipend                                 | 0.00        |
| By legal expenses                          | 0.00        |
| By publication                             | 9000.00     |
| By training cost on course                 | 4477133.00  |
| By government contribution to pension fund | 0.00        |
| By maintenance of vehicles                 | 610440.00   |
| By POL for vehicles                        | 809090.00   |
| By Lab Chemicals                           | 51329.00    |
| By Estate Maintenance                      | 1303003.00  |
| By advance for expenses(Trg.)              | 181250.00   |
| By steel                                   | 745000.00   |
| By Furniture and fixtures                  | 17280.00    |
| By lab equipment                           | 1961.00     |
| by Office equipment                        | 224866.00   |
| By training equipment                      | 2512073.00  |
| By purchase of vehicles                    | 431557.00   |
| By photographs & photograph equipment      | 397008.00   |
| By Library books                           | 851908.00   |
| By Journals & Periodicals                  | 2323839.00  |
| By Campus Development                      | 477707.00   |
| By construction of buildings               | 2419182.00  |
| By Architectural & Management fee          | 318453.00   |
| By Road & culvert                          | 390141.00   |
| By Siberian Crane Project                  | 0.00        |
| CLOSING BALANCE:                           |             |
| Cash in hand                               | 0.00        |
| FDR                                        | 0.00        |
| Bank balance with UBI                      | 0.00        |
| By cash in Bank with UBI (training a/c)    | 0.00        |
| G.P.F:                                     | 0.00        |
| Carried Over                               | 91448981.91 |

**Brought Over****91448981.91****Brought Over**

|                                                       |                    |                    |                    |
|-------------------------------------------------------|--------------------|--------------------|--------------------|
| Payment during the year                               | 0.00               | <b>10259146.59</b> | <b>70262946.23</b> |
| Bank balance (closing)                                | 0.00               | 0.00               | 1021656.00         |
| Kisan Vikas Patra                                     | 0.00               | 0.00               | 1131132.03         |
| FDR                                                   | 0.00               | 0.00               | 3000000.00         |
| <b>PENSION FUND:</b>                                  | <b>0.00</b>        | <b>0.00</b>        | <b>1000000.00</b>  |
| Expenditure during the year                           | 0.00               | 0.00               | 23490.00           |
| Bank balance (closing)                                | 0.00               | 0.00               | 1005447.25         |
| <b>FDR</b>                                            | <b>0.00</b>        | <b>0.00</b>        | <b>1400000.00</b>  |
| <b>Kisan Vikas Patra</b>                              | <b>0.00</b>        | <b>0.00</b>        | <b>1450000.00</b>  |
| <b>CONSULTANCY PROJECT A/C:</b>                       | <b>0.00</b>        | <b>0.00</b>        | <b>6967159.50</b>  |
| Payments during the year                              | 0.00               | 0.00               | 3873720.90         |
| Closing balance (bank)                                | 0.00               | 0.00               | 23180.00           |
| <b>CONSULTANCY projects</b>                           | <b>0.00</b>        | <b>0.00</b>        | <b>100000.00</b>   |
| By Squirrel project (refund of Institutional charges) | 0.00               | 0.00               | 0.00               |
| By SAARC contribution                                 | 0.00               | 0.00               | 0.00               |
| By refund of Asian development fund (double payment)  | 0.00               | 0.00               | 0.00               |
| <b>TOTAL:</b>                                         | <b>35435432.50</b> | <b>10259146.59</b> | <b>91448981.91</b> |

**TOTAL:**

sd/-  
(S.S.OBEROI)  
Finance Officer

sd/-  
(S.K.MUKHERJEE)  
Director

**EXPENDITURE**

|                                 |                    |                            |                     |
|---------------------------------|--------------------|----------------------------|---------------------|
| To salaries & Allowances        | 14219694.00        | INCOME                     | By Grant - in - aid |
| To Bonus                        | 236202.00          | <b>Less:transfer to</b>    | <b>10365975.00</b>  |
|                                 |                    | capital expr               | 34684025.00         |
|                                 |                    | By Training cost           | 2057516.00          |
|                                 |                    | By Other Receipt(training) | 3601757.50          |
| To Honorarium                   | 24927.00           | By Int. on trainee a/c     | 45649.00            |
| To fellowship                   | 715300.00          | By Int. on bank deposit    | 324742.00           |
| To Wages                        | 678576.00          | By panel interest          | 9094.00             |
| To Travel exps                  | 1650007.00         | By Misc. receipts          | 726266.00           |
| To New Paper & Magazine         | 26815.00           | By Training cost accrued   | 365000.00           |
| To Publicity & Adv.             | 277385.00          | but not received           |                     |
| To Operational Expr             | 2800817.00         |                            |                     |
| To Seminar & Work shop          | 112501.00          |                            |                     |
| To Stationary                   | 505711.00          |                            |                     |
| To Rent                         | 112380.00          |                            |                     |
| To Postage & Telegram           | 146999.00          |                            |                     |
| To Sports goods                 | 46388.00           |                            |                     |
| To Telephone & TC               | 671345.00          |                            |                     |
| To Electricity & Water charges  | 1655004.09         |                            |                     |
| To printing & binding           | 50160.00           |                            |                     |
| To Govt. contr. to pension fund | 1353086.00         |                            |                     |
| To LTC                          | 150027.00          |                            |                     |
| To Audit fee                    | 6750.00            |                            |                     |
| <b>Carried Over</b>             | <b>25440074.09</b> |                            |                     |

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**Wildlife Institute of India****Income and Expenditure Account for the year 1997-98**

|                                 |                    |                            |                    |
|---------------------------------|--------------------|----------------------------|--------------------|
| <b>EXPENDITURE</b>              |                    | <b>INCOME</b>              |                    |
| To salaries & Allowances        | 14219694.00        | By Grant - in - aid        | 45050000.00        |
| To Bonus                        | 236202.00          | <b>Less:transfer to</b>    | <b>10365975.00</b> |
|                                 |                    | capital expr               | 34684025.00        |
| To Honorarium                   | 24927.00           | By Training cost           | 2057516.00         |
| To fellowship                   | 715300.00          | By Other Receipt(training) | 3601757.50         |
| To Wages                        | 678576.00          | By Int. on trainee a/c     | 45649.00           |
| To Travel exps                  | 1650007.00         | By Int. on bank deposit    | 324742.00          |
| To New Paper & Magazine         | 26815.00           | By panel interest          | 9094.00            |
| To Publicity & Adv.             | 277385.00          | By Misc. receipts          | 726266.00          |
| To Operational Expr             | 2800817.00         | By Training cost accrued   | 365000.00          |
| To Seminar & Work shop          | 112501.00          | but not received           |                    |
| To Stationary                   | 505711.00          |                            |                    |
| To Rent                         | 112380.00          |                            |                    |
| To Postage & Telegram           | 146999.00          |                            |                    |
| To Sports goods                 | 46388.00           |                            |                    |
| To Telephone & TC               | 671345.00          |                            |                    |
| To Electricity & Water charges  | 1655004.09         |                            |                    |
| To printing & binding           | 50160.00           |                            |                    |
| To Govt. contr. to pension fund | 1353086.00         |                            |                    |
| To LTC                          | 150027.00          |                            |                    |
| To Audit fee                    | 6750.00            |                            |                    |
| <b>Carried Over</b>             | <b>25440074.09</b> |                            |                    |

**Brought Over**  
 To refund of excess instt charges  
 of squirrel project 23180.00  
 To Entertainment charges 25625.00  
 To SAARC Contribution 100000.00  
 To Stipend 84045.00  
 To OTA 251835.00  
 To Legal Expr 137442.00  
 To Training cost 4477133.00  
 To Repair & maintenance of vehicle 610440.00  
 To POL for vehicle 809090.00  
 To Lab chemical 51329.00  
 To Estate maintenance 1303003.00  
 To Landscaping 487337.00  
 To Publication 9000.00  
 To Uniform 7586.00  
 To Trade tax 381773.00  
 To consultancy project expenses 6967159.50  
 To Excess of income over expenditure 13478328.31  
**TOTAL:** 54644379.90

54644379.90

25440074.09

54644379.90

To refund of excess instt charges  
 of squirrel project 23180.00  
 To Entertainment charges 25625.00  
 To SAARC Contribution 100000.00  
 To Stipend 84045.00  
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 To Estate maintenance 1303003.00  
 To Landscaping 487337.00  
 To Publication 9000.00  
 To Uniform 7586.00  
 To Trade tax 381773.00  
 To consultancy project expenses 6967159.50  
 To Excess of income over expenditure 13478328.31  
**TOTAL:** 54644379.90

25440074.09

54644379.90

**PERMANENT ASSETS AS ON 31-3-98**

| <b>PARTICULARS</b>              | <b>OPENING BALANCE</b> | <b>ADDITIONS DURING THE YEAR</b> | <b>TOTAL</b>        |
|---------------------------------|------------------------|----------------------------------|---------------------|
| LAND                            | 6607214.65             | 0.00                             | 6607214.65          |
| TREES                           | 2432709.00             | 0.00                             | 2432709.00          |
| Avenue Plantations              | 2354350.15             | 0.00                             | 2354350.15          |
| Campus Development              | 3507366.31             | 477707.00                        | 3985073.31          |
| Lab equipment                   | 1261699.07             | 1961.00                          | 1263660.07          |
| Furniture & Fixtures            | 7839752.69             | 17280.00                         | 7857032.69          |
| Vehicle                         | 5194690.21             | 431557.00                        | 5626247.21          |
| Library books                   | 7805195.28             | 851908.00                        | 8657103.28          |
| Office Equipment                | 3613512.90             | 224866.00                        | 3838378.90          |
| Camp Equipment                  | 526129.34              | 0.00                             | 526129.34           |
| Photographs & Photos equipment  | 1205462.20             | 397008.00                        | 1602470.20          |
| Materials and supplies          | 3863727.95             | 0.00                             | 3863727.95          |
| Educational films               | 1080432.35             | 0.00                             | 1080432.35          |
| Journals & Periodicals          | 9827438.00             | 2323839.00                       | 12151277.00         |
| Training equipment              | 16908499.24            | 2512073.00                       | 19420572.24         |
| Boundary Wall                   | 1446200.59             | 0.00                             | 1446200.59          |
| Boundary fencing                | 817934.93              | 0.00                             | 817934.93           |
| Building complex                | 92226268.00            | 2419182.00                       | 94645450.00         |
| Architectural & supervision fee | 5783433.85             | 318453.00                        | 6101886.85          |
| DG Set                          | 715126.00              | 0.00                             | 715126.00           |
| EPABX                           | 1176484.00             | 0.00                             | 1176484.00          |
| AC Plant                        | 2597452.00             | 0.00                             | 2597452.00          |
| Staff quarters                  | 3175520.00             | 0.00                             | 3175520.00          |
| Road & culvert                  | 1333970.00             | 390141.00                        | 1724111.00          |
| Tennis court                    | 530852.32              | 0.00                             | 530852.32           |
| Auditorium                      | 856592.00              | 0.00                             | 856592.00           |
| <b>Total:</b>                   | <b>184688013.03</b>    | <b>10365975.00</b>               | <b>195053988.03</b> |

sd/-  
 (S.S. OBEROI)  
 Finance Officer

sd/-  
 (SUSHANT CHAUDHURY)  
 Registrar

sd/-  
 (S.K. MUKHERJEE)  
 Director