NATIONAL ZOOLOGICAL PARK

Master Plan

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PART I
Perspective Plan

New Delhi

June 1988

NATIONAL ZOOLOGICAL PARK

Master Plan

Page 30 - 36
by
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Executive Summary

OBJECTIVES

With the general goal of promoting the conservation of wildlife, the NZP would have the twin objectives of educating the public about wildlife and the need for conservation, and of breeding wild animals in captivity.

A number of strategies would be adopted to achieve these objectives.

EDUCATION

This would involve imparting information, helping the process of understanding, and of sensitization.

All these would be achieved through a natural display of carefully selected species, organised in a manner designed to promote understanding of nature and its interlinkages.

The educational process would be facilitated through imaginative educational signage, through a visitors centre, and through other educational activities, including talks, discussions, educational games, audio-visual programmes and guided tours.

The target audience would include the general public, especial groups such as school/and college students, and professional groups, like journalists, teachers or administrators.

CAPTIVE BREEDING

Broadly speaking, captive breeding of animals can be undertaken for one or more of three objectives:

1. For display, at the NZP or at other zoos.
2. For research into breeding biology.
3. For reintroduction into the wild, either immediately through re-introduction programmes, or potentially by building up holding populations.

Only the first two types of breeding would be done at the NZP Breeding for re-introduction would be done at separate facilities, but in collaboration with the NZP for the Breeding Programme to be carried out in or near Delhi. National level planning and coordination is essential for the captive breeding programme in India.

STAFFING

A thorough review of the staffing pattern and policies at NZP is required, and considerable strengthening of the middle level supervisory staff, especially curatorial staff, is seen as a major priority. The existing level of expertise among the NZP staff needs to be upgraded, and their promotional avenues need to be developed.

RESEARCH

There is great need for strengthening the research, monitoring and evaluation activities at the NZP. These activities must primarily be aimed to assist in the better management of the NZP, and of wildlife management in general.

ORGANISATION

The NZP should be given functional autonomy by transforming it into a registered society. The funding should however, continue to come from the Government of India.

COMMUNITY INVOLVEMENT

The NZP should provide a much greater scope for involving members of the community with its management and functioning. It should set up a membership organisation, along the lines of "friends of the zoo" of some foreign zoos, and involve volunteers in various activities, especially educational activities.

FUTURE DIRECTIONS

The detailed master plan should be formulated by a special master plan committee set up for the task. This committee should be assisted by special groups and sub-committees and should associate experts and professionals with their work.

The master plan committee should have an adequate budget to pay for professional advice and for the administrative expenditures.

The work of drafting the master plan should be completed within 15 months.

The present document, essentially the perspective plan, should be circulated to the various experts who have commented either on the NZP or on the earlier draft master plan, and their comments on this document should be made available to the master plan committee.

1. PREFACE

The task of drafting a master plan for the National Zoological Park can be seen to be divided into three phases. In the first phase a draft document was prepared and opinions of experts from across the world were solicited on this document and on the NZP. This phase culminated in a meeting of various experts, called by the Ministry of Environment and Forests, Government of India, at the India International Centre, New Delhi, on 24 January, 1988. This meeting threw up a lot of good ideas which formed the basis for the second phase of work.

The second phase involved the drafting of this document, the perspective plan, which lays down the objectives of the NZP, and specifies the strategies to be followed in fulfilling these objectives. The perspective plan also identifies the general principles which would govern the detailed planning for the NZP and indicates the broad areas for which further detailed planning is required.

The proposed Phase Three Planning will involve the drafting of the second document, the detailed plan, which would include the operational plan setting out the details, schedules, budgets and the time frame.

Methodology

During the drafting of this perspective plan we have drawn heavily on the earlier draft master plan, on the guidelines provided with the terms of reference, and on the verbal and written comments made by various experts on the draft master plan and on the National Zoological Park (NZP) itself.

Our methodology involved identifying the needs for a master plan for the NZP, and clarifying what a master plan should be. This was done through discussions among the group, based on the various comments received.

The next level of tasks involved the identification of the goals, objectives and strategies relevant to the NZP and to decide upon the topics to be dealt with in the perspective plan, and the manner in which they were to be organised.

The more contentious issues were identified and thrashed out, and then the task of formulating the general principles underlying the varied activities and facilities of NZP was taken up.

The group met formally four times (on April 10, April 24, May 21 and June 29, 1988), though there were numerous informal consultations between two or more members of the group.

Acknowledgements

Members of the group, individually or collectively, had discussions with various experts. Shri B.C. Choudhury of the Wildlife Institute of India, Dehradun, generously assisted with the work of the group and helped significantly in moulding our thinking about captive breeding programmes.

Shri Duleep Matthai, both through his written comments and his guidance, made the task of this group much easier.

Though it is not possible to to thank all those who contributed to this effort, special mentions must be made of all those who participated in the meeting on the NZP master plan at the India International Centre, on 24 January, 1988.

Among those whose written comments formed a basis of our thinking are : J. Dohortey, N. Ellerton, D. Jones, P. Joslin, D.Matthai, and L.R.Oliver.

Special thanks are due to Mr. Klaus Berkmuller and Dr. J. Desai of the Wildlife Institute of India, who shared with us the benefits of their experience, the former in the field of conservation education, and the latter in the management of the NZP. Dr. N. Prasad and Shri Kishore Rao of the WII also gave helpful suggestions.

Shri. H.S. Panwar and Dr. J.Sale of the WII were gracious enough to allow one of the group members (Dr. A. Rodgers) to participate in the work and to attend the various meetings.

Mr. A.J. Dekker, Shri Rajesh Thapa and Ms. Rachanaa Maheshwari helped to get the computers working, and to coax out of them much of this document.

2. TERMS OF REFERENCE

No. 25-35/86-(WL-I)

Government of India
Ministry of Environment & Forests

PARYAVARAN BHAWAN, C.G.O. COMPLEX
LODI ROAD, NEW DELHI-110003

25th March, 1988.

OFFICE MEMORANDUM

In pursuance of the decision taken in the meeting for the finalization of the Master Plan of the National Zoological Park, Delhi, "Guidelines for Preparation of the Master Plan of the National Zoological Park, Delhi" have been drawn out. Now it has been decided to form a group comprising of the following, for finalization of the proposed Master Plan :-

1) Shri Shekhar Singh, Indian Institute of Public Administration, New Delhi.

2) Shri Kamal Naidu, Director, National Zoological Park, Delhi.

3) Shri B. Majumdar, Joint Director (WL)

4) Dr. A. Rodgers, Wildlife Institute of India, Dehradun.

Shri Shekhar Singh would be the co-ordinating authority and shall be responsible for finalization of the Master Plan within the time schedule.

The group should start functioning from 1.4.1988 and should submit the first document of the Master Plan positively by 30.6.1988. No extensions should be necessary under any circumstances. Preparation of the first document would involve certain incidental expenses like hiring the services of certain specialists like a land planner, architect, computer programmer and would also involve the use of a word processor and zeroxing facilities. These expenses will have to be borne by the National Zoological Park, Delhi from their own budget for which a separate sanction would be issued. Such expenses should, in no case, exceed Rs. 10,000.

It is also clarified that the document has to be prepared within the framework of the guidelines annexed herewith.

The Master Plan document would be based on the following :-

1.1 Guidelines for the preparation of the Master Plan mentioned above

1.2 The relevant portions of the existing draft management plan of the zoo

1.3 The points raised and the discussions made in the meeting held on 24.1.1988 for finalization of the draft Master Plan

1.4 Written comments on the draft Master Plan

1.5 Other documents that the committee may consider relevant.

The Master Plan, first document, would broadly speaking, include -

2.1 Brief history of the Zoo and the background to the planning process in the zoo.

2.2 Listing of the present resources and activities of the zoo

2.3 Statement of the objectives of the zoo

2.4 Details of the activities to be undertaken for fulfillment of these objectives

2.5 A general statement on the inputs required to plan and design the proposed activities

2.6 An appraisal of the time and the resources required to compete the second document of the Master Plan.

The members of the group would not get any honorarium for the work. They will draw the usual traveling allowances etc. within the framework of the rules from their own institutions.

-Sd-
(M.K. Ranjitsinh)
JOINT SECRETARY TO THE
GOVERNMENT OF INDIA

GUIDELINES FOR PREPARATION OF THE MASTER PLAN OF NATIONAL ZOOLOGICAL PARK, DELHI.

The primary objective of the National Zoological Park, Delhi is to create public awareness of the significane of wildlife conservation and to directly contribute to the national effort in this field. This would be achieved through the following activities :-

1. Display of captive animals
2. Captive breeding of rare and endangered species
3. Education
4. Research.

Recreation would be permissible in the National Zoological Park (NZP) only so far as it is consistent with the primary objective of conservation and activities outlined above.

The four main activities stated above would each have the following guidelines for their implementation :

1. Display of captive Animals

1.1 The main purpose of display would be to promote an understanding of and an empathy for wildlife conservation.

1.2 The NZP should have a manageable population of selected species commensurate with its present area. The NZP would work out its carrying capacity in terms of the number of large animals and then decide on the pattern and extent of the display of both indigenous and exotic species.

While doing so -

a) Steps required for accommodating the maximum number of visitors should also be taken into account.

b) Requirement of water-space for migratory birds shall be kept in view.

1.3 The display should conform to the highest international standards and the animals should be kept in enclosures as similar to the natural habitat of the species as possible, to provide the animals with a biologically appropriate environment.

1.4 Children's Zoo and safari park should not form part of the NZP.

1.5 Unique representatives from other parts of the world should be displayed, but there is no need to continentalise the display. Display of more than one species, very similar in nature, should be avoided.

1.6 The NZP will not capture any wild animal for purposes off display only. This is to be differentiated from captive breeding programmes for rehabilitation or for saving the species from extinction.

1.7 The heritage value of the Purana Quilla shall be maintained and no structures, which would discardant or obstruct its visibility, should be raised.

1.8 The number of each species has to be restricted to manageable limits. Excess animals should be transferred to other zoos as far as possible. Culling of animals or vasectomy of the males could be done where no such demand exists. Euthanasing animals which are senile, deformed, incurable or disabled may also be done.

1.9 The NZP should have areas designated for various kinds of usage, including plantations and to be kept undeveloped as wilderness. Area under gardening should be minimised.

1.10 The plantation areas should be earmarked imaginatively, keeping in view all the other requirements of the Zoo. Selection of species should take aesthetic, educational and environmental needs into account.

1.11 Planting will be done near enclosures to provide vision barriers between enclosures.

2. <u>Captive Breeding</u>

2.1 The primary objective of captive breeding of rare and endangered species would be :

a) Rehabilitation and reintroduction in the wild

b) Where such rehabilitation or reintroduction is not possible, propagation of specie in captivity to ensure that it does not become extinct.

2.2 Breeding for such purpose would be confined to Indian species. Captive breeding of rare and endangered species would be for education and will be subservient to the two main objectives mentioned above and could also extend to a few selected exotic species.

2.3 Such captive breeding should be of species which can adapt to the climate of Delhi.

2.4 The National Zoological Park should try captive breeding of a few selected species for the purpose of rehabilitation and reintroduction into the wild and saving them from extinction, taking into account its experience with certain species. It should not duplicate successful efforts of other zoos.

2.5 It would not be possible to extend the present land area of the National Zoological Park. Such captive breeding could, therefore, be carried out in specially designated areas outside Delhi.

2.6 Improved veterinary care, hygienic upkeep and balanced nutrition for animals will be given the highest priority.

2.7 Exchange, loaning or pooling of animals from different zoos would be essential to achieve the requisite genetic diversity amongst captive-bred stock. Stud-books should be maintained and utilised for this purpose.

2.8 The NZP shall direct its attention to prevent in-breeding and shall avoid artificial selection, and there will be no explicit or implicit attempt to inter-breed species and genera for any purpose.

3. Education

3.1 The main objective of education would be :

a) Sensitisation of people towards conservation

b) Education of people in animal behaviour and the breeding of different species.

3.2 Education would be at two levels. -

a) Teaching staff of different schools and colleges, who can then inculcate a feeling for nature conservation amongst the students.

b) Education of visitors to the zoo.

3.3 Help from non-governmental organisations and volunteers should be availed of.

3.4 The activities of NZP and the National Museum of Natural History would be complementary. They should not duplicate each others efforts.

3.5 "Interactive wayside" displays should also be used with traditional methods to educate the visitors.

3.6 Educational standards of the staff should be such as to enable them to interact successfully with the visitors.

4. Research

4.1 The main objective of research should be to assist in better management of zoo and in conservation of wildlife. A conscious attempt shall be made not to duplicate research being done elsewhere and to obtain data already available.

4.2 The NZP should not be involved in biological research, which should be left to other scientific institutions and which could be financed by Government.

4.3 Research about human behaviour and their requirements as far as it relates to the zoo, is as important as research on zoo animals.

4.4 Veterinary, animal hygiene and nutrition aspects should get top priority.

4.5 The NZP may participate in the international zoo network. It would strive to attain a standard that would enable it to function as a focal point for coordinating zoo activities in the country. In this context, it will, inter alia, coordinate and monitor research, exchange of animals, maintenance of stud-books, training activities, tranquilisation techniques and veterinary care techniques.

3. INTRODUCTION

This first document of the NZP master plan essentially contains the perspective plan for the NZP. It seeks

-to identify the objectives of the NZP

-to describe the strategies to be followed in achieving the objectives

-to lay down the general principles that ought to govern the design and management of different aspects of the NZP facilities and activities

-to list the areas that need to be planned for in greater detail by technical sub-committees as part of the second document of the master plan, and

-in general, to lay a foundation for future planning activities.

3.1 What is a Master Plan

"A Master Plan is a plan that depicts in concrete terms the future forms an establishment and its infrastructure should take. In the case of a complex like the NZP the Master Plan should describe the tangible forms of this institution, in both the short term as well as in the foreseeable future. It should encompass not only the physical structures but also the administrative and/ or management organisation structure and all that goes with it, in terms of the total requirements of personnel and the manner in which they will be deployed. A Master Plan must present a comprehensive multi-dimensional perspective of the future of the institution in all its aspects and depict it in quantifiable and concrete terms. It must also lay down priorities for the progressive implementation of the Plan. (Matthai, D., 1986)

A master plan has three separate components :

Description Where all of the history, background, resources, values, problems etc. are described and documented. Reference lists provide full bibliographies, details of research etc.

Control The decision making or policy framework, where the present and potential values and problems have been evaluated, short term and long term objectives stipulated and the strategies to achieve these objectives outlined.

Operation The work plans, setting out schedules of operation, staff duties and function, development, maintenance and budgets all on a time frame basis.

"It is recommended that a strategic plan be prepared as a next step. The plan would examine the proposed goals of the institution, namely conservation, education and research, and develop strategies that measurably strive to attain the goals. It would spell out in detail how a significant proportion of the species currently exhibited are to be sustained in the long term. It would define how to increase the level of awareness and concern for wildlife among a broad sector of the zoo audience and the public at large. It would outline the criteria by which to increase the National Zoo's achievements over time so that it could be translated into X number of self-sustaining species by year Y, X number of people who become ardent supporters of wildlife by year Y, and so forth.

"The strategic plan would dictate the final form of the master plan, the latter being a document that primarily describes the proposed modifications to the physical facility."
(Joslin, Paul; 1988A)

The preparation of a master plan has three phases, each of importance :

The preparatory phase:

The collection and analysis of much of the basic information pertinent to the project.

The collection and assimilation of a wide range of opinion on project needs and problems.

The Perspective Planning Phase:

The identification of goals, objectives and strategies.

The laying down of the general principles for formulating the detailed master plan.

The realisation of additional information needs, and the organisation of research programmes to obtain this information.

The review of past performance.

The discussion of internal administrative and work procedures and external linkages to improve future performance and output.

The Implementation phase :

Clear formulation of planning strategies, lines of control, guidelines on future landuse, infrastructure integration.

Time frame for development activities and long term budgets.

Implementation of work schedules, organisational procedures and annual budgets.

Master Plans have to specify long term goals but have to be flexible enough to accommodate changing patterns of the environment and changes in value perception. Plans therefore have to have a built in review mechanism, and require rewriting every ten years.

"After defining the purpose of the institution, most master plans review the intended concept and set out the basic guidelines which are to be adopted. This is followed by a summary of data on site evaluation, which includes an assessment of climate, vegetation, landform existing structures and other relevant constraints."(Joslin, Paul; Undated)

This group has concentrated on the preparation of only part of the master plan - the formulation of policy. However, the group has started the collection and preparation of basic materials for long term detailed planning, such as maps, scale models, computer data base and planning materials from other zoos in India and elsewhere.

3.2 The Need for a Master Plan

Considering the role and definition of what a master plan could and should do, and the scale and complexity of the NZP we believe the need for a master plan is self-evident. NZP is not a static organisation, it is continually developing and adapting to meet the demands upon it from both government and its conservation agencies, and the general public. This development should not be in a random or haphazard manner attempting to respond to every requirement or criticism but along well defined and well planned guidelines, leading to the fulfillment of specific objectives. Management itself must become more objective oriented, and a master plan is necessary to set out selected long and short term objectives and targets.

The NZP does not function in isolation. Its linkages and responsibilities to other organisations need careful definition and planning.

The NZP is not without its problems; internally, regarding staffing as well as animal and infrastructure requirements and, externally, as regards linkages and liaisons with the parent Ministry, Delhi authorities, CPWD etc. A master plan analyses the cause of these problems and suggests solutions.

Government sees the need for greater contributions from all zoos in the fields of conservation education and captive breeding. Such increased activities need careful planning if they are too succeed.

The NZP is a 'National' institution, under the control of Central Government. In some respects therefore it should be viewed as a model institution, involving the best traditions and practices of zoo management and administration. Optimum management can only take place under the umbrella of a management plan.

Some of the current problems at the NZP are a result of inadequate planning at the initial stages. A master plan at the inception of the NZP would have gone a long way in preventing the haphazard growth of the NZP staff, especially the lower level staff. The master plan would have laid down a phased recruitment policy ensuring adequate promotional avenues, minimum education, relevant training, etc. for the NZP staff.

A master plan would also have given the NZP a long term perspective, and prescribed a mechanism for systematic periodic review of the objectives, strategies and management of the NZP. It would have helped immunise the NZP to arbitrary and ad hoc changes and pressures, both from within and from without.

4. THE NATIONAL ZOOLOGICAL PARK

4.1 Profile of the National Zoological Park

The National Zoological Park (NZP) was founded in 1959. It is located off Mathura Road, in New Delhi, and bounded on its North and North-East by the Purana Quilla, and on the South by Sundar Nagar residential colony. To the East there is a railway track and then the river Yamuna (see map in annexures). The NZP has an area of 85.60 hectares.

Over the years the NZP has developed into a major attraction for the citizens of Delhi and visitors alike. In 1986-87 more than sixteen lakh people visited the zoo, and on some days there were as many as 40,000 visitors.

The NZP, apart from displaying various wild animals, has been conducting a variety of educational activities for the benefit of the visitors. It has organised talks, quiz programmes, and conducted tours for school children.

The wilderness areas and ponds in the NZP are an important refuge for migratory birds, especially water fowl. During the winter the bird population of the NZP swells appreciably and it is a favourite haunt with bird watchers.

Note: For more details see Annexure iv.

4.2 Current Problems

The NZP has evolved over the years in a haphazard and relatively unplanned manner which has led to erratic development, with some aspects being very good, while others are very poor.

It is to the credit of the management that despite these handicaps the zoo continues to be a major attraction and is regarded as one of the best in India.

There has been no clarity concerning the objectives of the NZP, and the strategies to be followed. Educational activities are sporadic, animal enclosures of varying quality. There is no visitors centre and hardly any contact with the public.

Though there have been some notable successes with captive breeding, there is no systematic or scientific programme.

Unrest among staff, and inadequate middle level supervisory staff are two major problems. The existing middle level staff is mostly not trained or inclined to do well the work required from them. Considering the very poor promotional avenues, there is little incentive for the staff to work well.

Visitor pressure and vandalism are other major problems at the NZP.

Over the years the pollution levels in and around the NZP have gone up alarmingly. The water quality is very poor, there is considerable air pollution and the adjoining railway line adds to the noise levels of the NZP significantly.

The NZP has also been inhibited from tackling its problems expeditiously, and from working towards its objectives, because of the constraints put by the rules and procedures of a governmental system.

The lack of a master plan, along with the absence of a clear policy on the development of the NZP compounds these various problems.

5. OBJECTIVES OF THE NZP

The ultimate goal behind the creation of zoological gardens or parks is the furtherance of wildlife conservation. All objectives and strategies of management are secondary to that goal.

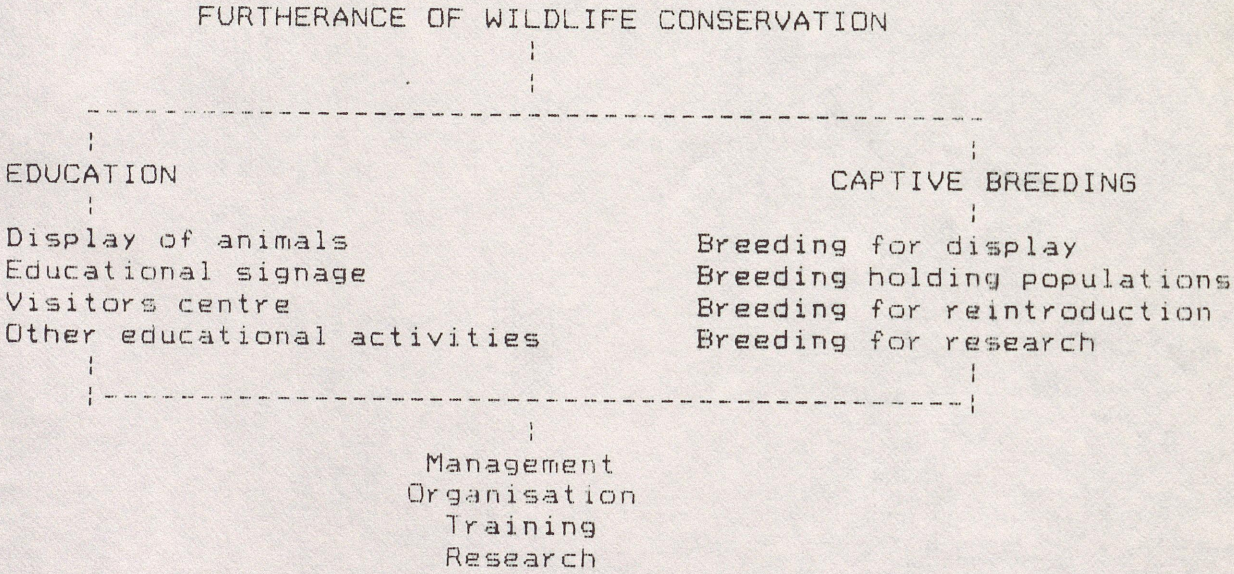
A zoo is different from other conservation institutions in that it maintains wild animal species in captivity. This we believe serves the cause of conservation in two ways.

Education. The public have an opportunity to learn about nature, natural systems, wildlife, and conservation problems and to sensitise themselves to living nature.

Breeding. Species considered endangered in the wild may be bred in captivity to reduce pressure on wild populations, and possibly to eventually release captive bred animals back into the wild. Breeding is thus a clearly defined programme distinct from the routine keeping of animals. The breeding for display purposes is seen as a major objective for NZP.

These two objectives may have several strategies.

The principles governing the development of the two objectives, and the strategies thereof are discussed below. The management of the zoo resources to implement the objectives is discussed in a later section.



5.1 Education

Educating and sensitizing the public is to be a primary function of the NZP. It is essential, therefore, that much thought goes into the design and organisation of educational material and activities.

The proper design of an educational programme requires an understanding of:

- the message(s) to be conveyed
- the age and socio-economic background of the the target audience
- audience behaviour, preferences, educational and literacy levels, linguistic abilities, etc.

"Who is the zoo serving ? What percent are families ? What percentage contain young children ? Where do most of the visitors come from ? How does the social strata characterized by the zoo attendees compare with the Delhi community ? How often do the visitors come ? Why do they come ? What percentage are school children coming in organized groups ? What ages predominate among the school children who visit ? These are just a few of the basic, as yet unanswered, questions that if known would provide insight into how best to set about sensitizing the public. It is strongly recommended that the zoo include among its research objectives some effort to find the answers to these questions." (Joslin, P., 1988B)

The people that the zoo would be catering to are :

the general public of a wide range of backgrounds and literacy levels.

school and college students

selected groups of professionals, like journalists or teachers or administrators

It must be remembered that many visitors come to the NZP for enjoyment and relaxation. It is the task of management to ensure that educational messages can be transferred to the visitor without detracting from his sense of enjoyment.

"The bulk of people come to a zoo for enjoyment and not to engage themselves in any kind of formal education. To have an effect upon them, it is necessary to make learning such a fascinating experience that they cannot tell it from recreation. A few of the ways in which this can be done are by :

1. Creating sense of total involvement. Sometimes this is possible by providing walkways that enable visitors to pass through exhibits. More often it is accomplished by taking parts of the animal's environment and extending these into the visitor space. In addition, all animal and people barriers should complement the setting, the signage should be thematically correct and even the costuming of zoo personnel should be appropriate to the area, where possible.

2. Encouraging continuity of thought through the creation of one-way traffic flow patterns past a series of exhibits that tell a story in stages. Although not uncommon in museums, this approach has only become prevalent in zoos in the past few years, especially in Europe. It is also going through some teething problems as zoos experiment with path lengths and methods of encouraging visitors to use one-way systems."(Joslin, P., Undated)

"Education" covers a number of distinct concepts or strategies. First, there is the transfer of simple information:

eg. This is a Lion Tailed Macaque
It is found in rainforest of Western Ghats.
It is considered rare and endangered.

Second, there is the process of understanding why certain things have happened:

eg. The Lion Tailed Macaque is rare due to loss of habitat by land alienation, resource exploitation and poaching. These activities take place due to ignorance and lack of alternative resources for local people, as well as inadequate management inputs.

Thirdly, there is the process of sensitising the visitors to conservation, by moving them personally and emotionally, thereby helping develop a concern for the problems facing wildlife, and by providing an incentive to make them want to do or learn more.

Educational activities can include a large number of passive (displays, signage) and active (discussions, self - participation) programmes, involving several instructional media.

We illustrate the diversity of such programmes with an indication of their suitability for information, understanding and sensitisation impact on two distinct target groups, general public and special groups. (See table on next page)

MATRIX TO ILLUSTRATE EDUCATIONAL VALUE OF POTENTIAL PROGRAMMES IN THE NZP

Display/ Activity	General Public			Special Groups		
	Inf.	Und.	Senst.	Inf.	Und.	Senst.
Natural Display of Animals	*	**	**	*	**	**
Signage	**	*	*	*	*	
Visitor Centre Exhibits	*	**	**	**	**	**
Guidebooks & Literature	*	*		**	**	*
Information Kiosks	**	*		*		
Preplanned Discussions	*	*	*	**	**	**
Keeper/ Volunteer Discussion	*	**	*	**	**	*
Guided Tours	**	**	*	**	**	*
Animal Demonstrations		*	**		*	**
Conservation Games		**			**	*

* = Relative degree of impact; Inf. = information; Und. = understanding; Senst. = sensitization.

The most distinctive feature of a zoo is the presence of displays of captive animals. Other educational media (signage, interpretation centres, lectures etc.) can be found in other institutions and places, e.g. museums, colleges and national parks. The role of <u>live animal displays</u> needs some further discussion.

The display has to be educative, and educative in an enjoyable informal way. The visitor should be able to learn not only what the animal looks like, but also something about its habitat and its life style.

The display should draw the visitor into the habitat and attempt to make him feel the experience of being in a desert, or forest or mountain range. Naturalness thus becomes a key concept of display.

The required educational themes of the zoo should be decided before the planning of exhibits. Exhibits should then be chosen and designed to best illustrate these themes. Possible themes include :

"the diversity of wildlife between and within habitats in India"
"the integration of species into communities and ecosystem"
"the adaptation of animals to particular environments."
"the conservation of wildlife ressunces in India."

Above all is the emphasis on Indian wildlife and the need for its conservation.

This wealth of educational activity will require the provision of a full time senior education officer with the capability to develop innovative educational programmes in NZP and to liaise with other educational organisations in Delhi. We believe the longterm objectives of conservation education will be best served by the appointment of a small education subcommittee within the NZP to oversee and advise on educational matters.

The planning group felt it was not possible to give detailed guidelines on developing educational programmes until after the completion of a detailed survey of visitor use of the NZP. We do however give principles governing the design of signage, animal exhibits and the visitor centre in later sections.

We give examples of some of the educational activities found in other zoos across the world in Annexure v. We stress the need for the NZP educational officer to learn from these activities, if necessary by a study trip to better zoo institutions.

5.1.1 Display of Animals

The impact of a zoo on the visiting public is primarily dictated by the way the animal populations are displayed in their enclosures, and the way these enclosures are organised and distributed within the zoo premises. The educational objectives behind the display of animals have been elaborated in an earlier section. Here we discuss the issues concerning the management of the zoo towards those objectives. We do this in three subsections:

- The choice of species for display
- The organisation of these species within the NZP
- The design of enclosures

Choice of Species

A zoo, to most people, is a place where a wide variety of animals are kept for all to see. There is, therefore, a tendency among some zoo administrators to consider the number of species their zoo contains as an indicator of its importance and quality. This was perhaps the criterion for judging the importance of zoos till a few years back. Fortunately, today at most of the good zoos the world over there is a greater stress on the quality of display, rather than on the quantity of display.

"The desire to maintain a diverse range of species must be balanced against reasons for maintaining a species and ability to manage and exhibit the species chosen. Species selection should be based on educational value, vulnerability of the species in the wild, ability to maintain the species long term and interest to the visitor." (Ellerton, N., 1988)

"While some zoos may still wish to display a wide variety of the world's wildlife, the majority, and particularly those in the larger urban centres, should make a speciality of the diversity of wildlife in India, but rather than having large comprehensive collections, should concentrate on displaying a relatively small number of representative species in a way which is educational and which reflects the high standards of wildlife management now expected in the wilderness areas of the country." (Jones, D.M., 1988)

We agree with this policy and therefore feel that the number of species in the NZP should be reduced by perhaps a third, and that the remaining species should be displayed in better enclosures and, where relevant, in larger numbers.

The species which are identified as being surplus must either be transferred to other zoos which might need them, or allowed to die out.

Though it is not the purpose of this document to build up a definitive list of the species to be displayed, the general principles relevant to the selection of such species include the following.

- The NZP should primarily focus on displaying Indian fauna.

- Only those species which can be properly housed and displayed at the NZP (in enclosures akin to their natural habitat) should be kept. (See section on Design of Enclosures).

- Only those species which can be properly maintained over a long period should be selected. For example, those species which will not be able to breed at the NZP and are not easily replaced either from the wild or from other Zoos, should not be kept at the NZP.

- It is not normally necessary to exhibit two species which are sim ecologically or taxonomically, except as part of displays to illustrate diversity and adaptation.

"Studies at Brookfield zoo have shown that frequent visitors are not drawn to visit unexplored corners of the zoo any more than first time visitors. Rather frequent visitors were found to consistently utilize less area of the zoo, focusing on a few favoured exhibits". (Joslin, P.,1988B).

For furtherance of the education objective these additional selection principles are of importance

- The selection of species must be in accordance with the themes and systems adopted for their display. In the NZP this would imply that animals found in the zoogeographic range within which Delhi and its surrounds falls will be displayed as a part of the ecosystem, perhaps in multi-species displays, while many other species would be displayed according to ecological characteristics. (For details of the organisational scheme refer to section on Organisation of Species).

- Animals which have unique educational value or are very popular with visitors must be preferentially considered.

- Generally, speaking, animals which are not good exhibits (inactive, very shy, nocturnal) should be avoided, unless essential for some other objective, such as diversity and adaptation displays.

- Species which are prominently associated with the heritage of India should also be considered for selection.

- Species which are dangerous to keep without proper safeguards should only be kept if the required safeguards are present. For example, poisonous snakes should only be kept in appropriate enclosures, and that only if necessary facilities for administering anti-venom serum are available at the NZP, which they should be in any case.

"Zoos that still maintain and exhibit their wild animals in rows of cramped, bare cages and pens are no longer acceptable and they give the zoo visitor the impression that zoo keepers are little more than jail keepers and what kind of appreciation for wildlife can we expect visitors to leave the zoo with after viewing the imprisoned." (Doherty, James G.,1988B)

"The average amount of time spent looking at exhibits in most major zoos is about 2 hours. This being the case, the size of the collection may not need to be unduly large to satisfactorily fulfill public interest." (Jones, D.,1988B).

"Quality of the collection rather than quantity is what is important. It is better to have fewer exhibits done well than many exhibits done poorly". (T.N. Seshan, quoted in Joslin,P.; 1988B)

"Ideally a balance is struck which draws strong attention to what one has at home yet does not totally ignore the broader picture." (Joslin, P; 1988B)

A list of the animals currently at the NZP is appended (Annexure iii). However, to build a final list various factors have to be considered, apart from the general principles enunciated above. Some of these are :

- the area and layout of NZP
- the design of enclosures
- the scheme of animal organization
- the requirements of captive breeding
- the educational activities designed for NZP, and
- the monetary and infrastructure constraints.

It is firmly believed that the NZP should endeavour to improve the display of animals that it intends to keep, even if in the process of achieving a sufficiently high level of display it has to reduce the number of species it holds.

It must also be remembered that most of the present stock is fit only for breeding for display in Zoos (see section on breeding). As this changes and new stock becomes available to keep as back-up holding populations, the priorities might undergo further changes, especially as space and facilities would be required for the holding populations.

Organisation of species within the NZP

In theory the species within a zoo can be organised in many ways, from a random or haphazard arrangement to planned displays based on geographical, taxonomic or ecological groupings. In practice, the need to repair or replant enclosures and the necessity of accommodating new (and often unplanned) arrivals means that even well designed arrangements have anomalies. The detailed planning of species organisation in NZP requires the input of a specialist sub-committee during phase two planning. Here we give some guiding principles only.

- The choice of organisation stems from the objectives stipulated for the particular zoo.

- As NZP has objectives of breeding a range of endangered species for display, conservation and exchange purposes, it will be necessary to have more than one enclosure for several species. The other enclosures may be away from the public areas and need not be designed for educational impact.

- The educational strategies of NZP include stressing the importance of 'an integrated ecosystem' with special reference to the Gangetic Plain - Vindhyas-Aravalli region of Delhi and surrounds. Such theme displays require multiple species exhibits, such as nilgai-sambar-chital-boar-peacock, or blackbuck- gazelle- bustard. The creation of such exhibits should receive great priority and be in a prominent part of the Zoo.

- Whilst we can see merit in all three organisational schemes; eg:

  geographic - " this is an Indian faunal community, compare it to the African"

  taxonomic - " examine the great diversity of species within say the primates"

  ecological - " look at the types of community adaptation found in an evergreen forest fauna"

We believe the first two are better suited to very large collections without specific priorities (as for example in London Zoo). As the prime objective of NZP is to display indigenous Indian fauna then the last scheme, using ecological communities (eg the desert, the rainforest, the mountains etc.) has much to recommend it.

Planning must pay special attention to management requirements. Curation becomes easier if for example all the primates are in fairly close proximity, allowing specialist kitchen and cleanliness and supervisory inputs. However, the danger of epidemics goes up with close proximity of animals of the same family, and this must be taken into consideration while planning the enclosure locations.

The group suggest that specialist groups of animals such as lesser reptiles, nocturnal species, small animals etc. be housed in single specialist facilities (a reptile house with capability of temperature control for example). Within such facilities the display of animals could follow the accepted ecological classification. We see no need for an aquarium at NZP.

Design of Enclosures

Perhaps one of the most important aspects of Zoo Planning, and untill recently the most neglected, is the design of enclosures.

Today it is well recognised that animals displayed "out of their element" very rarely evoke the required response among visitors. Infact, it can be argued that badly displayed animals often create antipathy among the visitors, and sometimes even appear ridiculous and unattractive.

Badly designed enclosures contribute to the mental and physical sickness that Zoo animals often suffer from , and they are also cruel insofar as they restrict free movement, or deny proper protection and shelter.

At present the NZP is a mixture of good, indifferent and bad enclosures. Though opinion differs on specifics, it is generally agreed that much can be done to improve almost all the enclosures.

The identification of improvements required in specific enclosures, and the design of new enclosures, was seen as a task for the second document. There also has been a great deal of useful and informed comment from foreign zoo experts. Here we suggest some of the general principles concerning the design and modification of enclosures :

- The enclosures should be as natural as possible, depicting in an imaginative may the natural habitat of the animal enclosed.

- The enclosures should be so designed that bars and other artificial barriers are hidden from view.

- Viewing angles should be carefully worked out to ensure that while at one enclosure other people or buildings cannot be seen. This helps build up a feeling of authenticity.

- By use of trees and/or mural paintings, enclosures should be given a feeling of depth so that their "Zooness" is minimised.

-The comfort and security of the animal should be fully considered while designing an enclosure. For example, research has shown that it is better to view animals at level, rather than from above, as this is less intimidating to the animal

The group felt that there are so many new ideas regarding the design of enclosures that as a part of the preparation work on the second document, a special sub-committee should review ideas and experiences the world over and develop suitable designs for the NZP. It felt that such a sub-committee should also visit some of the leading zoos across the world and see their enclosure designs, their failures and their successes.

(For some more ideas on design of enclosures see annexure vi)

5.1.2 Educational Signage

> "The point is often made in the zoo, museum and wildlife world that there is no point presenting an animal in whatever form unless you tell people something about it and why it is interesting and important. Adequate resources must therefore be put into this aspect of exhibit design otherwise it is rather like building an expensive car without putting an engine in it."(Jones, D.M.; 1988).

Educational signage, which includes display panels, signs, verbal or graphic descriptions, and should hold the visitors' attention and communicate to them the conservation message, is an important method of educating the visitors and getting them interested in the world of nature. There is also directional signage in a zoo, which directs visitors to various facilities and enclosures. This, however, is not discussed here but dealt with in the section on infrastructure. While designing educational signage for the NZP, certain problems have to be kept in mind :

- A large number of the visitors to the NZP are either illiterate (this includes children under 6), or semiliterate.

- Visitors to the NZP come from various parts of the country (50% being from outside Delhi) and the world (10% foreigners). They do not necessarily read English or Hindi.

- Signage in the Zoo competes for the visitors' attention with a large number of other, often live and colourful, stimuli.

There are also visitors (may their tribe increase!) who want to not only look at animals but also be informed about them. Hopefully, a good Visitor Centre will motivate a good number of the common casual visitors — irrespective of caste, creed, nationality. There are quite a few conducted tours of school Children who have a right to be informed. Interest of such groups cannot and shd not be ~~subordinated~~ a victim to the lack of concern of the 'crowd'.

Basic principle should be :-

(i) The exhibit should be attractive to the eye of the casual visitor and to the inquisitiveness and intelligence of the more interested ones i.e. should be catchy but not obtrusive and shd have reasonable amt. of information.

(ii) Signs are as much prone to vandalism as to the weather, particularly the UV radiation. Choice of material or placing vis-a-vis reach for mutilation/graphiti.

- Visitors are usually standing or walking when they see most of the signs, and they are, therefore, far more inclined to move-on then to stop and read.

- Research in Zoos abroad shows that on an average a visitor does not spend more than four seconds looking at any particular sign. It is, therefore, difficult to design a sign which is neither too vague nor so lengthy that the visitor reads only a part and moves on.

- Visitors are known to quickly loose interest in repetitive forms of signage.

What about weathering?

- Signs are often a target for vandalism, and therefore their design has to be relatively immune to vandalism. They must also be easy to repair or replace when damaged.

A proper design of signage for the NZP must be based on

- an appreciation of the generally existing problems the world over

- a study of the research and advances made in India and abroad on the science of effective communication.

- an understanding of the visitor's characteristics, response, behaviour and preferences as prevalent in the NZP and in other Indian Zoos.

The Centre for Environmental Education (CEE), Ahmedabad, is currently engaged in designing and fabricating signboards for the NZP. Unfortunately, little is known of the general principles being applied by the CEE. However, as the required research into visitor characteristics, responses, behaviour and preference at the NZP has not been conducted, a proper basis for the design of signage does not exist.

"Simple messages about the interdependence of man and nature, the importance of environmental issues and the patrimony of India's wildlife should be major components of the visitor experience. In effect the zoo has a huge captive audience of potentially interested persons ..... The zoo has the opportunity, and therefore a responsibility, to take a pioneering role in conservation and scientific education". (Oliver, L.R., 1988)

In general, signs should conform to the following principles :

- Give only as much information as can be grasped in the average attention span. If too much information is given, the public fails to take in even the basic message.

- Give a conservation message designed to appeal not only to the intellect but also to the emotions and sentiments of the visitors.

- Wherever possible the NZP should develop participatory signage of the sort "where the public interacts with the sign by lifting a part of it, turning it or in some way physically involving themselves with it __" (Joslin, p., 1988).

- Also, "signage that poses questions that create curiosity to know the answers and/or stimulates conversation among the Zoo visiting group" (Ibid) should be developed for the NZP.

- The signs must have a high proportion of illustrations and graphics.

- The Signs must be catchy and use to advantage shape, color and other devices to attract attention.

- Signs should also be placed near lawns, rest places and ticket booths so that they can be read while visitors are resting, eating or waiting to buy their tickets.

At present the signage at the NZP does not conform to most of the stated principles and, as such, a new set of signage is required. Considering a large number of new signs have already been put up by the CEE, and more are in the pipeline, it is considered appropriate that the CEE work in collaboration with the master plan committee and consider their suggestions in designing the remaining signs.

5.1.3 Visitor's (Interpretation) Centre

The need for an Visitor's Centre at the NZP is recognised, and it is strongly believed that it should be located at the NZP entrance. The Visitor,s Centre is seen as:

- the major information pavilion, supported by outlying information and facilitation kiosks and stands.

- the focal point for both passive (e.g., seeing displays) and active (e.g.,participation in discussion) education.

It is understood that the Centre for Environmental Education (CEE), Ahmedabad, was given the responsibility of designing the Visitor's Centre. The only document made available to the Group was the draft National Zoological Park Interpretive Plan, India/USA Planning Team, New Delhi, Oct/Nov. 1983. This has a somewhat sketchy description of the proposed Visitor's Centre. Efforts to get further details were not successful. However, informal conversations with a representative of CEE revealed that the CEE were only involved in designing the interior and the displays, and that even this work had not started as the NZP had not finally indicated where it wanted to locate the Visitor's Centre!

Whereas the detailed designing of an interpretive system is a task by itself, some of the points to be considered are:

- The Visitor's Centre should not be an institution in its own right, but an integral part of the educational effort at NZP.

- The Visitor's Centre should be designed as the entry point for many of the visitors. Acting as an information pavilion, the Centre will allow visitors to understand the layout of the NZP, the logic behind it, be informed of how long it would take to see all/some of the exhibits, and be advised on alternate ways of structuring their visit.

- The Visitor's Centre should be used to display current information about the NZP, listing any special attractions, events, opportunities, etc., that might interest the visitor.

- A separate section of the Centre must be reserved for visitors to use on their way out : where they can get answers to specific queries, buy or get references to literature & audio visual material, buy souvenirs and give their suggestions or criticism.

- The Visitor's Centre should also serve to communicate the primary, but only the primary, educational message that the NZP hopes to convey. The Centre should not be used to impose a clutter of information on the visitor.

- A third section, containing an auditorium and class-room would act as a briefing and debriefing facility for organised groups of visitors, especially school and college students, and their teachers.

- The lay out of the Centre must provide for these three separate functions, as also for supportive infrastructure.

The designing of the Visitor's Centre must begin anew and be based on the education plan for the NZP. It is anticipated that the design of educational activities at the NZP should not take more than three months to reach a stage where the role of the Visitor's Centre is clear enough to enable its detailed planning.

5.1.4 Other Educational Activities

The NZP must also develop other strategies for educating the visitors. Some possible ways are listed below.

- Having volunteers near different enclosures talking to visitors about the animals and the eco- system.

- setting up small stalls where visitors can handle animal skin, bones, claws, etc.

- developing and selling informative literature and toys/gifts.

- experimenting and developing sound-tracks which include natural jungle noises, animal calls and an informative narrative.

- developing and organising games, especially for the children, which help them to understand animal behaviour and characteristics, while providing recreation. (For an example of conservation games see annexure v)

- creating a media centre at the NZP where high quality films and audio visual programmes can be shown to the general public and to special invites. Such films can be commissioned and their screenings can be preceded or followed by discussions and lectures.

5.2 Captive Breeding of Species

Captive breeding of species has been recognised as one of the major conservation activities of the NZP.

Animals could be bred in captivity

- for display in zoos
- to form a holding population of endangered species which acts as a backup to the population in the wild
- for reintroduction in the wild
- for studying the breeding biology of particular animals
- for barter and/or sale to other zoos

Different types of breeding programmes need to be designed to meet each of these objectives. (See flowchart at end of section.)

> "The need for captive breeding, particularly of endangered species, has now been widely accepted as the only means of saving certain extinction. Zoos are considered among the most valuable centres where this can be done and this purpose has therefore come to be accepted as a primary objective of the modern zoo." (Matthai, D 1986)

In developing breeding programmes in India in general and at the NZP in particular, the questions that need to be asked are:

- which species are to be bred ?
- for what purpose ?
- in what numbers ?
- from what stock ?
- in how many places ?
- how ?

We take breeding to mean the complete process leading to the successful rearing of young individuals. It may be necessary for example to have hand rearing facilities for some species.

The scientific management of breeding programmes in a modern zoo includes elements of three separate activities.

- the monitoring of captive populations including individual animals which freely and regularly breed in captivity, and checking that genetic diversity is adequate.
- the deliberate design and manipulation of breeding for animals which rarely breed successfully in captivity, but which may do so given especial conditions and treatment.

- the control of animals which may breed too much, for example lions (especially the crossbreed African Asian animals) and tiger. Control may include periodic separation of sexes, use of surgical techniques such as vasectomy and the use of temporary birth control chemicals given as subcutaneous implants or injections.

Breeding for display in zoos

Both Indian and exotic species could be bred for display in zoos. The choice of which species to be part of purposeful breeding programmes must primarily depend on:

- what is required for display at the NZP (and at other zoos) and is not readily available from other sources

- what has good barter value for display in zoos.

It must be recognised that these animals are only for display and that they or their progeny should not be reintroduced in the wild. Reasons for this include genetic and health problems, and are enumerated in the section on breeding of endangered species.

The numbers to be bred should be calculated taking into consideration:

- the holding capacity of the NZP

- social organisation of species, i.e., more of gregarious species, less of solitary species

- the projected demand from the NZP and other zoos, which includes the popularity of young animals with visitors.

- the requirement for barter.

It must be ensured that the stock used for breeding has adequate genetic diversity for this purpose (i.e. offspring will be viable etc.) and is in good health.

The NZP should breed these animals at the zoo premises, ensuring that enclosures used for breeding are appropriately designed (see section on enclosure design).

The NZP should liaise with other zoos to ensure that breeding populations of these species are spread over many zoos (at least three) and expertise on their breeding is developed across the country (see section on organisation of breeding).

Where the "know how" for breeding a particular species is not available, experimental breeding programmes should be started to develop such capability (see flow chart at end of section).

BREEDING OF ENDANGERED SPECIES FOR CONSERVATION PURPOSES

There are at least two different tasks involved here:

- The continued maintenance of a viable captive population of an endangered species, which could, if necessary, be used to restock wild populations in the future.

- The creation of a large scale breeding programme to actually restock a wild area, or perhaps to introduce a species.

Both these tasks are discussed here.

Great care must be taken in the breeding of endangered species that are to be reintroduced into the wild, or are to form holding populations; for example :

It must be ensured that

- they are bred from genetically pure stock and not tainted with inbred genes, or bred across sub-species and valid races

- the breeding stock has adequate genetic diversity to produce a viable population representative of the range of variation within that taxon.

- the breeding takes place in a climate and environment as akin to the species' natural habitat as possible. Breeding in different climatic or environmental conditions can result in better survival of those of the animals which are adapted to the breeding environment, but not necessarily to their natural environment, to which they have finally to return

- human imprinting does not occur as this can make some animals (like the ungulates, or pheasants) even more vulnerable, while others (like the big cats or the salt water crocodiles) a greater threat to human beings

- the animals do not contract zoonotic diseases (TB being a major problem in most Indian zoos).

Keeping these points in mind, the endangered species to be bred in Delhi should be those whose natural distributional range includes the Indo-Gangetic plains, the Northern Deccan, the lower Himalayas, or those which are widespread across India.

<u>The Breeding of Holding Populations</u>

The purpose of maintaining holding populations is to provide a backup to the endangered populations in the wild. In case the populations in the wild disappear or fall below the critical level needed for their survival, these holding populations can be activated to restock the wild populations.

If viable captive populations suitable for breeding for reintroduction into the wild are not available, then the collection of individuals from the wild could possibly cause extinction by further depleting an already critical population.

It is to avoid such dilemmas that the maintenance of holding populations is crucial.

Holding populations also serve as basic stock for research into breeding biology: research which may significantly enhance the chances of saving the species in the wild.

The number of animals in any holding population should be determined on the basis of the minimum number required to maintain a genetically viable breeding stock, and on the basis of the facilities available to house them properly. The significant cost of maintaining holding populations is also a factor to consider.

Full safeguards have to be observed in identifying the breeding stock and choice of location for breeding. It must be ensured that holding stock of any endangered species is maintained in at least three different collections. This not only minimises the danger of accidents but also allows for genetic diversity by exchange of animals.

Breeding for holding populations or for reintroduction in the wild ought not to be done within zoo premises as the danger from zoonotic diseases and from human pressures and imprinting is too great in zoos. The NZP should, therefore, acquire land on the outskirts of Delhi, perhaps near or in the proposed wildlife sanctuary in south Delhi, to set up a captive breeding facility. This must be away from the pressures of the city but near enough for supervision by the zoo personnel. The relationship of the NZP to this and other captive breeding facilities is discussed in the section on the organisation of breeding.

The NZP present site could become a holding facility for extra backup populations of those endangered species whose natural range includes climates similar to that of Delhi. However, this should only be done after the incidence of disease is controlled at the NZP.

Breeding for reintroduction in the wild

This activity is essentially similar to breeding for holding populations and thus requires similar safeguards. Such programmes should also be undertaken only in facilities outside the NZP.

There are, however, three difference

- breeding for reintroduction in the wild usually involves breeding at a much bigger scale, for hopefully the natural habitat can accommodate a much larger number of animals than the holding facilities

- this requires an interface with the field organisation which would actually manage the reintroduction programme.

- The reintroduction programme is usually of shorter duration, as once the reintroduction of a particular species is successfully completed, the focus shifts to another species.

The obvious field agency to interface with the reintroduction programme is the Wildlife Wing of the State Governments. In consultation with them, a proper programme must be worked out for each species identifying

- the location of the breeding centre, preferably near the site of reintroduction.

- the number of animals, of either sex, to be reintroduced

- the measures required for managing their habitat

- the mechanisms of monitoring the reintroduction

- the procedure for implementing possible corrective measures

- the indicators by which the programme can be evaluated.

It must be remembered that, except in very unusual circumstances, and even then with great caution, animals which have been bred from impure or inbred stock ought not to be reintroduced in the wild. The reintroduction of such animals could lead to serious biological distortions.

Only where a species is extinct or extremely endangered in the wild and no suitable holding population exists could such a step be considered. But we must quickly ensure that this eventuality never arises by building up holding populations.

Experimental Breeding to Study Breeding Biology

Where the breeding biology of a species is not known, it is necessary to run experimental breeding programmes to develop techniques. Though such programmes should be run in environments similar to the natural range of the animal, and should follow the safeguards prescribed for breeding holding animals and reintroduction stock, such programmes for certain selected species could initially be run in the premises of the NZP, considering the high level of supervision and monitoring required

However, efforts must be made to ensure that within the NZP the area chosen is relatively free from disturbance and the enclosures used should approximate as closely to the animals natural habitat as possible.

Organising of Captive Breeding

A captive breeding programme for endangered species is crucial to the Nation's conservation effort and should not be left as one of the many activities that an already pre-occupied zoo administration has to manage.

A properly run breeding programme requires a high level of scientific expertise as well as close supervision and management. It requires constant co-ordination with breeding centres in India and abroad, for captive breeding cannot be planned or executed in isolation.

Choice of the species to be bred, organising multiple breeding centres, ensuring that all endangered species are being bred in adequate numbers and with adequate care, identifying suitable breeding stock, learning from other people's experiences, all requires an elaborate organisational structure.

It must be kept in mind that a functioning breeding programme involves extensive movement of individual animals across the country to ensure that the maximum possible genetic diversity is achieved. Bureaucracy should not hinder such movement.

Today, the NZP, as all other Indian zoos, does not maintain accurate stud books, it does not have a system by which each animal can be identified, and it keeps very scanty records of breeding activities.

Though different species have been allocated to different zoos for breeding or for coordination of breeding effort, the allocation does not seem to be based on scientific considerations.

The absence of even basic records implies that most of the captive stock of endangered species in India is unfit for use as breeding stock for any immediate reintroduction and would require careful manipulation before they can meet with the stipulations for holding population breeding.

We strongly believe that:

- that captive breeding of endangered species be systematically organised in India.

- that the post of a national breeding coordinator be created to coordinate captive breeding programmes across the country

- that regional coordinators be appointed to assist the national coordinator, and that the regional coordinators function as species coordinators for the endangered species in their regions

- that suitable legislation be enacted to empower the national and regional coordinators to ensure that proper breeding programmes are run and that stud books and other records are properly maintained

- that special breeding facilities be created in different bio-geographic zones of the country, initially for the Himalayas, the North-East and for the Arid zone, to cater to the captive breeding of threatened species for each zone, and they be linked up with the appropriate zoos in the region

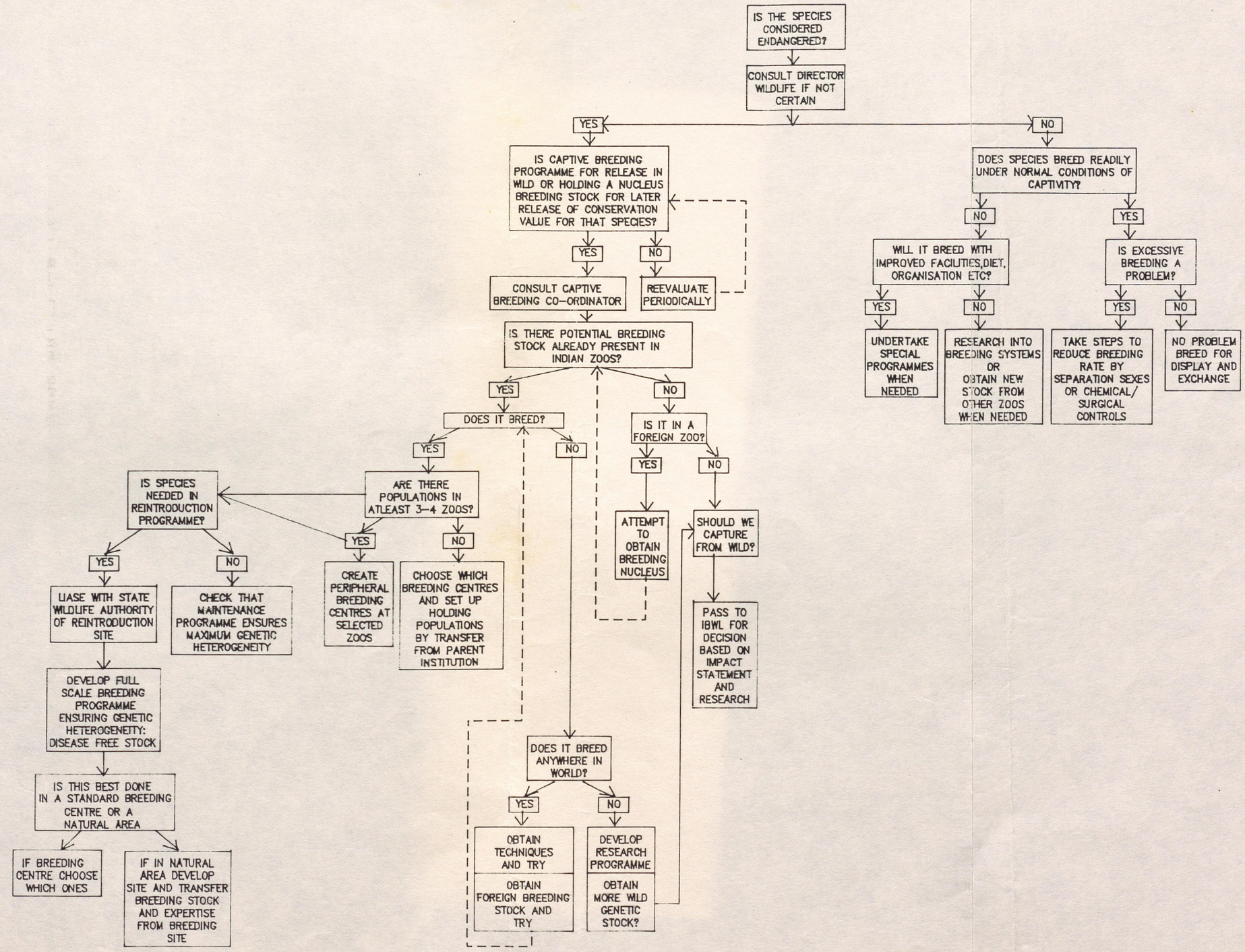
- that the NZP play an appropriate role in this organisation, and also be responsible for a breeding facility on the outskirts of Delhi

- that, however, the co-ordination of captive breeding in India be organised independently of the zoo system, though with their collaboration.

- that It is essential to computerise breeding information, collaborate with breeding programmes abroad, organise exchange of animals internally and from overseas, and draw up a directory of experts available for consultation to the breeding programme.

It is recognised that all this can not be done overnight and therefore a phased plan must be drawn up, which is not within the terms of reference of this group.

DECISION MAKING FLOW CHART FOR CAPTIVE BREEDING PROGRAMMES FOR WILDLIFE IN INDIA



6. MANAGEMENT OF NZP

6.1 Staffing

The ability and motivation of the staff is perhaps the most important factor determining the proper management of zoos, and the NZP is no exception.

The NZP requires four categories of staff

- senior supervisory staff, which includes the Director, Joint Director and Deputy Director
- middle level supervisory staff, which includes the Range Officers, Curators, and Head Keepers.
- junior staff, which includes the Keepers, Assistant Keepers, Malis, etc.
- special activities staff, which includes the Educational Activities Staff, Veterinary Staff, Research Staff, Security Staff, and others.

At present the NZP does have some staff at these various levels and categories . However the abilities and motivation of much of the staff have been identified as a major problem. There also appears to be a very inadequate middle supervisory level, including an almost total lack of curatorial staff.

There is a problem regarding the promotional avenues of most of the junior and middle level cadres. We understand that for the junior level staff this is at least partly due to the fact that a large proportion of them were appointed together or en masse around the same time with similar ages being officially recorded. This has made it difficult to provide most of them with even one promotion during their career.

Though it is not our purpose to detail the staffing patterns, qualifications, training and job descriptions in this document, we propose to look at one problem area in detail, the curator level which is perhaps the most crucial one, and lay down some specific guidelines.

The Need for Curators

The keeper and headkeeper levels are considered crucial to the well-being and proper management of the animals. The keepers are the ones primarily responsible for the immediate welfare of the animals under direct supervision of the head keepers and, assisted by the assistant keepers (who have basically cleaning duties).

It is recognised that the current staff at these levels is not "up to the mark" both in terms of abilities and motivation. Most of the Head keepers and keepers are promotees from the assistant keeper level, where they functioned primarily as conservancy staff. They do not have much education and often no special interest in, or talent for, dealing with animals. Their educational level is very poor, most of them not having even finished school. They therefore have little interest, incentive or ability in learning new techniques and procedures or providing even rudimentary documentation, or providing an educational input to visitors.

The ideal keeper would be one who has an adequate education (ie. a relevant University degree), has an interest in handling animals and is willing to work with his/her hands. Considering the job description, the social stigma attached to doing even minimal sanitation and conservancy work (a must for any keeper), and the problem of getting an educated person willing to do this, good keeper material would not be easy to come by.

It is felt that the only practical way of solving this problem is to start a training programme at the NZP for middle level supervisors, who can be given a stipend during their training and called Trainee Assistant Curators. Entrants to this programme must have at least a Bachelor's degree, and must be willing to work as curators in zoos and other animal holding facilities.

The NZP can then select those found most suitable after training, and appoint them as Assistant Curators, in the lower Range Officers scale.(Note: We do not use the term Curator to indicate senior policy making cadres.) Those remaining from any batch would most likely find employment in other zoos or other facilities like the proposed breeding centres (Of relevance are the recent advertisements for Coimbatore Zoo).

Obviously the NZP needs to create many more posts of curators, perhaps in exchange for some of the posts of malis, and the curators must in principle be able to go up to the senior supervisory levels at the NZP. There would also be promotional avenues in other zoos and facilities.

General Comments

We make more general comments on other staffing problems.

The decision to reduce the extent of formal gardens and use more semi-natural vegetation means the number of permanent malis can be reduced. Seasonal daily wages labour or contract labour can make up occasional staff shortfalls.

There is a need for permanent professional level staff in the following posts:

Education Officer, with proven ability in the field of conservation education, including innovative organisation.

Research Officer, with a general interest in wildlife science and the ability to train and organise NZP staff in monitoring studies.

Documentation Officer, with an ability to organise information on computers (a post subordinate to the research officer).

We believe that one of the Senior Supervisory level staff of NZP should function as regional species breeding programme co-ordinator and develop especial proficiency in the design of captive breeding programmes. The post of National Co-ordinator should be outside the NZP establishment.

The designation of Zoo Ranger be changed to reflect curatorial duties and adequate promotional avenues be opened for long serving staff, probably into Assistant Director grades.

The appointment of staff could be done in a phased manner to ensure that the administrative infrastructure required to support the work of these officers is available .

6.2 Physical Infrastructure

6.2.1 Physical Layout

The overall layout or ground plan of the zoo is not only important in determining how much visitors enjoy and learn from their visit, but also determines the gross limits of enclosure design and arrangement and the efficiency of zoo services such as sanitation, maintenance, visitor catering etc.

The broad physical plan of the NZP stems directly from the planning of objectives and strategies and must precede detailed planning of individual enclosures.

The first step in planning the physical layout is deciding on broad zonation. This document has already stated the need to separate the breeding of endangered species away from the zoo premises to new land, possibly in south Delhi.

Functional zones for the NZP would then include:

- Staff colony (including housing for some of the new staff, like the curators)
- Management infrastructure (eg. workshops, kitchens, veterinary facilities)
- Backup breeding enclosures

(Note: the above zones would be closed to the regular visiting public).

- Administrative zone (Entry and exit facility, administrative offices, visitor centre)
- Catering zone, which may have satellite refreshment stalls.
- The display zone of enclosures, gardens and wilderness areas.

We see no merit in providing a recreational zone with facilities such as children's play ground within the NZP, but this could well be a useful addition in the parking-catering area outside the main gates.

Some of the features that must be considered while planning the NZP layout are

- the approach to the NZP, which must be convenient and have adequate shaded parking space, keeping in mind the growth over the next two decades.

- the entrance to the NZP, which must be distinctive and provide an appropriate transition from the outer world to the zoo and an obvious and attractive access to the visitor's centre

- the visitor facilities like toilets, seats and benches, shady spots to sit in, restaurants, refreshment booths, etc., which must all be clean, conveniently located and well designed. The catering services need great improvement in design and quality of food. There is scope for one facility offering more expensive meals. These catering areas need clear demarcation to reduce litter and disturbance

- **directional signage** must be conveniently placed, clear and prominent

- **lawns and gardens**, which must be well planned and maintained

- **wilderness areas and water bodies** which support a lot of wild creatures. A single area should be designated as permanent wilderness. Other areas should be semi-natural barriers between enclosures

- **zoo exit** which must also be imaginatively designed as it contributes to the "last impression" that visitors carry away with them.

We believe that the NZP should have only between 30 and 50 % of the total area as lawns, gardens, paths, roads and visitor facilities. The remaining area, apart from the enclosures, should be maintained as wilderness area or as water bodies for use by water birds, especially migrants.

The NZP is an important winter refuge for migrant water fowl and for a large number of small animals which live in the wilderness areas. As far as possible, nothing should be done to disturb them.

Wilderness areas are also cheaper and easier to maintain than lawns and gardens and can be opened up in the future for enclosures or to meet the growing human pressures.

The question of the adequacy of NZP's land base for future growth requirements has been a controversial issue in the lead up to this group's discussions. It has been argued that the zoo area of 85.60 ha will be inadequate to cater for future growth and demand and that the NZP should expand its borders (there is a possible extra small parcel of land on the Sundernagar Garden, which theoretically could be purchased). However this small addition will not greatly affect NZPs capacity to absorb more public pressure, and there is little point in pursuing an expensive acquisition.

New policy guidelines for NZP indicate a decrease in species holdings and the concentration on exhibit quality not quantity. This reduces the demand for additional enclosure space.

However, we note that Delhi will reach a population of swome 18 million by 2000 AD, and demand on the Zoo facility will grow to increasingly high levels.The long term requirement for extra space to meet this visitor pressure will be best met by the development of a Safari park type facility outside Delhi and /or smaller satellite zoos in other areas of the capital region, and NOT by minor enlargements of NZP.

6.2.2 Sanitation

The sanitation section of the NZP collects and removes animal and garden refuse and visitor litter from within the zoo. Sanitation is important from the point of view of hygiene and aesthetics. Refuse levels run at about 5 tonnes per day.

The sanitation section is also responsible for the maintenance of public conveniences, water points, shelters and dustbins.

Pest control is a function of this section including mosquito, rodents and predators such as feral dogs.

The increase in visitor pressure and animal numbers means that the present section staff and facilities are inadequate and standards of hygiene have shown signs of deterioration.

Detailed phase two planning should pay attention to:

- demarcation of visitor picnic areas and cafeterias, thus limiting intense litter areas
- better dustbin facilities
- increased staffing and collection inputs
- a gobar-gas plant for organic refuse
- a larger incinerator
- manure and compost pits
- improved maintenance of moats and roadways for easier cleaning
- demarcation of duties and responsibility of keepers for cleanliness within enclosures
- professional advice should be sought on questions of pest control, bearing in mind the hazards of unplanned chemical control.
- the use of school children in "cleanliness campaigns" and the use of education and volunteers in impressing litter consciousness on visitors should be explored.

6.2.3 Other Logistics

Whereas a detailed evaluation of the logistical support and the infrastructure required at the NZP can only be done after the layout and locational planning has been completed, we intend to highlight a few of the major issues that need a close look.

Water : The water being supplied to the NZP is dangerously polluted and poses a serious threat to the health of the animals. Urgent measures need to the taken to find an alternative source of water supply, or to set up water cleaning plants, or both.

Pollution : The zoo is also subjected to a high concentration of air and noise pollution, both of which are detrimental to the health and well being of the animals and the visitors.

Comment has been made in the next section on the noise pollution caused by the railway traffic on the adjoining track. It is also considered necessary to hence forth not allow motor vehicles into the NZP. On one day of the week, handicapped persons or other people who are unable to walk due to infirmity, could be allowed to enter in motor vehicles during low-rush hours.

Apart from these, the detailed master plan must deal with staff housing, zoo kitchens and animal feed, electric supply, etc.

6.3 Veterinary Care

Modern concepts of zoo management visualise veterinary medicine as an integral component of all display and breeding programmes for captive animals. Increasing emphasis is placed on health maintenance and disease prevention rather than curative functions. The NZP already has a functional veterinary unit, but it is valuable to review the functions of such a unit and the principles which should guide its development and growth over the coming decade. It is important to note however, that zoo medicine is a new science in India, not or only sketchily taught in veterinary colleges. There is thus a shortage of competent zoo veterinarians and a very inadequate base of knowledge and documentation. It is thought therefore that the NZP has a role in developing a model veterinary unit as an example to other major zoos and which can be used as a field training facility for zoo managers and for veterinary colleges.

Major functions of the veterinary unit are seen as:

- Maintenance of health

  a) Prevention of disease
  b) Maintenance of hygiene
  c) Monitoring condition, parasite loads, nutritional inputs,
  d) Quarantine and health certification
  e) Vaccination programmes

- Curative Activities

  a) Diagnosis of disease conditions
  b) Treatment of sick and injured animals
  c) Management of surgical and obstetrical problems
  d) Maintenance of isolation facilities

- Documentation and Research

  a) Keeping records of health/disease conditions, and efficiency of treatment
  b) The promulgation of information to other zoo organisations
  c) The maintenance of information from other zoo organisations
  d) The participation in research programmes in collaboration with other organisations

- Training

  a) In service training to NZP personnel at all levels in hygiene, health and disease recognition

  b) Specialised training in zoo medicine techniques including capture, restraint, etc.

  c) Provision of facilities for visiting students.

There are several potentially serious hazards to animal health in NZP. These include increasing levels of atmospheric, water, noise and litter pollution, the presence of colonies of scavenging kites which deposit faecal matter in several locations, and growing populations of rats. Both kites and rats can be disease vectors. Untreated sewage effluent in Yamuna River water is a health risk and high levels of flyash and hydrocarbons in Delhi's air may cause respiratory problems. Noise stress comes from growing railway traffic on the adjacent main line which has a compulsory whistle stop.

NZP authorities will have to liaise with external agencies (railways, NDMC etc) to alleviate many of these hazards.

There is endemic Tuberculosis (TB) in many of the animal species in NZP, as there is in most zoos in India. Whilst this is unlikely to become a major epidemic, it does cause some mortality and considerable morbidity. More importantly it reduces the value of these captive animals for use in breeding designed for wild release.

The question of inbreeding is discussed under captive breeding programmes.

Some major principles governing the development of the veterinary unit are:

- It is not possible to take out of the zoo sick or injured animals for treatment or large carcasses for postmortem. Therefore the zoo has to have adequate infrastructural facilities available within it. These facilities include observation and isolation cages, operation theatre, simple diagnostic capability, postmortem and incinerator facilities, deep freezers etc.

- It is not possible for a small veterinary unit at the zoo to have full expertise in all aspects of veterinary medicine and health. The NZP therefore must have good liaison with centres of veterinary expertise in surgical, diagnostic, curative and pathological problems. Such liaison has to be a two-way relationship involving veterinary assistance from colleges and institutions and giving facilities for research and training.

- "Prevention is better than cure" is an admirable motto which suggests the veterinary unit concentrates on maintenance of health by ensuring adequate quarantine, vaccination, hygiene, nutrition etc. Sick animals must be isolated and zoo design must allow this. Euthanasia must become a perfectly proper means of disease control and an acceptable way of preventing unnecessary suffering by seriously injured or terminally ill animals. The NZP Director and Veterinary Officer should be authorised to prescribe such merciful euthanasia.

- Veterinary facilities should grow in a phased manner. There may be no need for expensive diagnostic equipment if such facilities are available at accessible centres of excellence. Bloodserum testing, histological examination etc. may be best done outside the NZP for years to come. But facilities for routine faecal sampling etc. should be maintained.

- Emphasis on breeding of animals for display within NZP may require the development of a nursery/ hand-rearing facility for young animals.

- Veterinary staff must maintain close linkages with regular keeper and curator staff within the zoo, in order to monitor health parameters.

Organisation of the Veterinary Unit: Whilst we believe the unit should be strengthened, we leave details of development to a technical sub-committee of the phase two plan which will examine these questions in more detail.

6.4 Linkages with Other Organisations

The NZP requires a considerable amount of support from other official and non-official agencies in

- management and infrastructure:

  electricity, water, traffic and crowd control, advanced veterinarian facilities, etc.

- education:

  assistance with educational programmes, outreach and publicity, etc.

A proper assessment of these requirements should be made and an appropriate co-ordination mechanism set up, involving representatives of the concerned organisations in the periodic reviewing of the NZP requirements and in planning for it. This must be at least an annual exercise.

6.5 Visitor Pressure

Present visitor pressure is estimated at 16,50,000 p.a. a figure which is growing rapidly (12,00,000 in 1980-81). These figures are not even throughout time, there are hourly, daily and monthly or seasonal peaks. Most pressure is at weekends and public holidays, and present policy has been to close the zoo on some holidays to prevent massive visitor inflow with levels beyond the present staff's capability to control. Present peak day number is 40,000.

Visitor growth rates suggest an annual visitor figure of 20 to 22 lakhs in ten years time. Some foreign experts believe the NZP can easily cater to visitor loads exceeding 2.5 million per annum. This may be so, but a more useful statistic is what is the daily carrying capacity without causing excessive disturbance to animal populations in the zoo.

Foreign expertise may base carrying capacity on short visits by relatively small & quiet groups of people in a cool environment. The people of Delhi often express enjoyment in noisier, less inhibited ways, a zoo visit probably includes long periods of relaxing and refreshment on shaded lawns, and the heat of summer months requires considerable spatial separation. Carrying capacities may thus be less than in a foreign zoo.

NZP authorities should plan to increase visitor load at non peak times, i.e. evenings, and day time visits by educational groups. Non specific advertising may lead to increased holiday visitation which should be avoided. Though we are not in favour of a general increase in the entry fee, but discretionary fee adjustment might be necessary to limit peak day visitation.

The NZP authorities must achieve greater regulatory capability to withstand peak day pressures. Increased use of volunteers may be one such strategy.

Nevertheless, having implemented strategies for better management of visitor pressure, it is essential for the NZP to reach out to the public and to inform them, through mass media and through posters and perhaps a newsletter, of all the exciting things happening in the zoo. This might increase the visitor load somewhat but would also ensure that the right sorts of visitors, those who come to the zoo out of interest in, and love for, wildlife and nature are encouraged to return more often and to become more involved with the happenings in the zoo.

7. TRAINING

The organisation of training requires, apart from the trainees

- a capacity to train
- a need for trained personnel

The NZP already has, and is envisaged to further develop, expertise in various areas of zoo and wildlife management. However, it is not clear whether there is, at the moment, a need for trained personnel in the country's zoo system.

Most of the zoos in the country are run by State Governments or by Municipal Corporations. It is understood that they have their own staffing policies and it might not be possible for trainees at the NZP to find jobs there.

It is, therefore, imperative that information be obtained from the State Governments and Municipal bodies concerning

- their staff appointment procedures
- their perception of the value of trained persons
- their perception on the type of training required

On the basis of this, it should be determined whether the NZP should train young men and women? for what? and in what numbers? or whether training should be restricted to existing employees of various zoos who have been sponsored by their employers.

In any case, the NZP does have an increasing ability to train personnel for various tasks and a proper study should, thus, be made on the training requirements in the country before training programmes are designed or implemented.

The one exception to this general principle is the training of Asst. Curators at the NZP. This is primarily because the NZP itself needs to strengthen its middle level supervisory capacities (see section on staff) and these trained Asst. Curators would hopefully have an alternate avenue of employment: the proposed captive breeding facilities.

Train the existing staff first - at least the ones who have adequate educational background and motivation

8. RESEARCH

We treat 'research' broadly, as any process of collecting and analysing information of value to the science and management of wild and captive animals, and their use for educational and breeding purposes.

Such a broad concept means that many scales of research activity which are undertaken by several different organisations warrant discussion. Three types of activities may be distinguished:

- "Monitoring", which we define as the continual checking and documentation of ongoing programmes or activities.
- "Research", which is a specific study designed to answer a specific question.
- "Evaluation", which looks back at a completed programme and compares achievement with planned results.

All of these are important to the efficient development of the NZP. The following programmes can be identified.

- A routine monitoring programme, mostly undertaken by zoo staff.
- Small scale research programmes by zoo staff.
- Research programmes solicited by the NZP but executed by outside agencies in, or partly in, the zoo (eg genetic finger-printing of endangered species).
- Research programmes solicited by NZP but executed by outside agencies outside the zoo (eg observing food habits of key species in the wild).
- Research programmes by outside agencies not solicited by the NZP, but which are permitted to take place in the zoo.
- Evaluation of management activities and programmes including the management plan.

It is important to spell out the principles governing the conduct of research in the NZP, and to have a policy on the basis of which requests for research in the NZP can be evaluated.

Considering the present low level of research into zoo biology and management in India and the need for such research, the NZP should actively encourage such research.

The scale of research requirements and the breadth of research expertise are far greater than the staff of NZP will be able to handle on their own, even with an enhanced research section. The efficient development of research activities must therefore involve liaison with outside agencies

Research activities will need some facility within the NZP, principally access to documents and records and a library of relevant reference material. Any requirements for material analysis (beyond routine veterinary procedures) is best catered for in specialist institutes.

Research activities should not be permitted to cause unnecessary hardship or disturbance to captive animals, or excessive inconvenience to management or the public. The zoo as a conservation centre is not the place for studies involving manipulative or experimental psychology, or any form of vivisection etc. Anatomical documentation/research on carcasses is of importance however.

The coordination of research activities and the supervision of monitoring and documentation will need the creation of a research cell under a specialist research officer.

Some level of priority should be given to potential research activities. A preliminary assessment suggests the following:

a) For general zoo management : regular monitoring of life history processes (eg. births, deaths, antler development,etc.).

b) For education : regular monitoring of visitors and their use of the zoo and reaction to different exhibits.

c) For breeding endangered species : the animals to be individually identifiable, and breeding history determined, genetic finger printing of selected species done to determine origins and genetics heterogeneity.

Some further detail is given for each possible research programme to illustrate their value and implementation in NZP.

Monitoring Programmes. This will largely involve the curator level staff with inputs from their keepers. Several sub programmes will be necessary, eg.

- Animal population statistics
- Time and frequency of births and deaths
- Biological parameters of growth, horn and antler development, onset of physical and sexual maturity, frequency of mating etc.
- Veterinary aspects of animal condition, nutritional inputs, parasite load, causes of morbidity and mortality.
- Visitor statistics; numbers, origins, categories, objectives, activities.
- Management inputs, enclosure changes, dietary changes, animal transfers.
- For breeding programmes, more close monitoring of individual animals may be necessary.

Such monitoring programmes involve the collection, documentation and storage, analysis and dissemination of data and results. It will involve all aspects of zoo management and require inservice training and coordination. A documentation officer will be needed, with access to, and expertise with, computer facilities.

Monitoring programmes by outside agencies would include the twice yearly bird counts by volunteer groups.

Small Scale Research Programmes

Interested zoo staff members should be encouraged to undertake their own minor research projects if this does not detract from general duties.

Research Activities in the Zoo Solicited by the NZP

This could include in depth sociological surveys of visitors, assessment of primate behaviour patterns, screening of ungulates for TB etc. etc. Expertise may be invited to advise on breeding programmes and to manipulate captive populations for increased efficiency. Further details should be given in phase 2 planning.

Research Activities Outside the Zoo, Solicited by the NZP

Detailed anatomical and histological studies of carcasses of animals dying in the zoo should be undertaken. Freezer facilities will be necessary. Again further details in phase 2.

Research by Outside Agencies and Individuals

We envisage an increase in application for "research" facilities. This could vary from a request by wildlife wings to collect dung of lesser carnivores to aid recognition in the wild, to a student wanting to observe social behaviour for a dissertation, to a veterinary college wanting histological material for research purposes. We believe the zoo should encourage such research, provided it does not detract from routine management activity. In years to come if pressure does become too much, then some means of prioritisation should be undertaken.

9. ORGANISATION

The group strongly believes that if the NZP is to achieve the objectives given to it even minimally , it must be given functional autonomy.

It is felt that this would be best achieved by making the NZP into a registered society with the Director, NZP as member secretary of the governing board, a nominee of the Ministry of Forests and Environment as a member, and prominent conservationists as other members, one of whom could be chairperson. The governing body could also have representatives of those governmental and non-governmental agencies who are closely involved in the NZP.

If the proposed "Friends of the Zoo" or similar organisation got off the ground a representative could also serve on this body.

The Government of India should continue to provide the basic funding for the NZP, Perhaps as a corpus grant, against nnual and long term budget proposals submitted by the NZP. The NZP could endeavour to supplement this income by its own revenue however small. But the primary objectives must be education & breeding, not financial self-sufficiency. Admission fees for example must be set low to encourage visitation amongst even the poorer sections of Delhi society.

This functional autonomy would enable the NZP to plan and implement its activities in a rational and dynamic manner, without being tied down by time consuming and often inappropriate government procedures. It would also make it easier to associate the public with the zoo and to have the sort of flexibility essential to what is primarily an educational and conservational institution.

The rigidity of the present system is seen as one of the major inhibitions to a sensitive and dynamic NZP management. It is understood for example that rules force the NZP to work through the CPWD for all civil works. The group was not able to get a contour map of the NZP through the entire period of its functioning as the CPWD was still in the process of getting the map prepared. It is understood that much other urgent work is held up for long periods of time due to procedural delays. Often zoos, which deal with living animals, cannot afford such delays, and they cause considerable suffering to animals.

The NZP can not, given the present set up, employ for short periods or at short notice talented persons to help with special activities and educational programmes. The rules do not permit the sort of flexibility necessary when dealing with volunteers, or well wishers keen to help, or with voluntary agencies.

10. COMMUNITY INVOLVEMENT

The NZP cannot, and ought not, to be an institution in isolation of the community of Delhi, or of the whole country, for that matter. It ought not to be seen as a government office or facility run by the government for the recreation or indoctrination of the masses. The NZP must be an institution which is seen by the people as their own, and accordingly valued and cared for.

It is, therefore, essential to reach out to atleast the Delhi community, to get them to participate in the planning, management and day to day running of the zoo and its various activities.

At one level this is partly achieved, and partly made possible, by granting autonomy to the NZP and involving concerned citizens in its governance by nominating them on the governing body. However, this should be seen as only the first step.

It is essential to form a forum, like "friends of the zoo", where members of the public can feel an involvement with the zoo and its affairs. This group can also, in time, become a vocal and ardent supporter of the NZP and if proper opportunities are provided contribute significantly to the development of the NZP.

It is also valuable to involve volunteers, from within or outside this group, in various tasks at the NZP. College students could help, on busy days, with education and extension activities, could be made responsible for certain specific activities, like doing bird counts in the zoo, or running a zoo magazine, or running educational programmes, could be gradually trained and motivated to support various functions at the NZP, and could act as standby volunteers to help in crisis management.

Special groups like school and college students and their teachers, journalists, administrators, architects, artists, etc. could both vastly benefit from a closer association with the zoo, and contribute significantly to it.

This participatory process, we believe, should start immediately and even the activity of finalising the master plan should be in consultation with the general public and with special groups.

11. FUTURE DIRECTIONS

For drawing up the detailed master plan for the NZP, the following groups and committees will need to be constituted, with the terms of reference indicated, and be asked to complete their work within the time frame specified. Both the planning process and the implementation of the master plan should have adequate budgetary provisions. Infact, the funds available for the planning exercise, and likely to be available for the implementation stage should be indicated to the committee in advance .

Committee	Time Frame
MASTER PLAN COMMITTEE	15 months
To finalise the second document of the master plan and to oversee the work of the other committees.	
1. Education Committee	
To draw up the detailed overall educational programme through the following sub-committees:	12 months
1.1 Species sub-committee	
-to draw up a list of the animal species, and numbers of each species, that are to be displayed at the NZP; to finalise the scheme of organisation of species.	2 months
1.2 Enclosure design sub-committee	
-to identify the animal enclosures that need demolition, modification or design.	
-to draw up a phased plan for the upgradation of the animal enclosures.	12 months
-to finalise the designs of the animal enclosures	
(all in consultation with the physical layout committee and the species committee).	

1.3 Educational design sub-committee

-to design appropriate educational signage.

-to design the visitor's centre — 12 months

-to design other educational activities including games, guided tours, etc.

-to design educational literature and audio-visual packages.

2. Breeding Committee

To draw up the list of animals to be bred at NZP for display at Zoos, or for barter. To link up with the National Breeding Committee and identify the role the NZP can play in breeding endangered species and in maintaining back up holding populations. — 6 months

Note: There is an urgent need to set up a National Committee on the captive breeding of Endangered Species to work out the details of a captive breeding programme in the country. In fact, the work of the NZP breeding committee has to be done keeping in mind the national breeding programme, as outlined by this committee.

3. Management Committee

To work out the details of the management structure of the NZP through the following sub-committees. — 12 months

3.1 Staffing sub-committees

-to finalise the staffing pattern for the NZP, including the qualifications, recruitment procedures, training, job-description, emoluments and career prospects of the staff. — 6 months

3.2 Physical infrastructure sub-committee

-to finalise the physical layout of the NZP. — 3 months

-to look into other logistical requirements, including sanitation.

3.3 Veterinary sub-committee

-to identify the veterinary facilities and procedures required at the NZP. — 3 months

4. Training Committee

-to identify the training requirements and needs, and to indicate the required facilities and staffing needed to run the proposed training programmes.	6 months

5. Research Committee

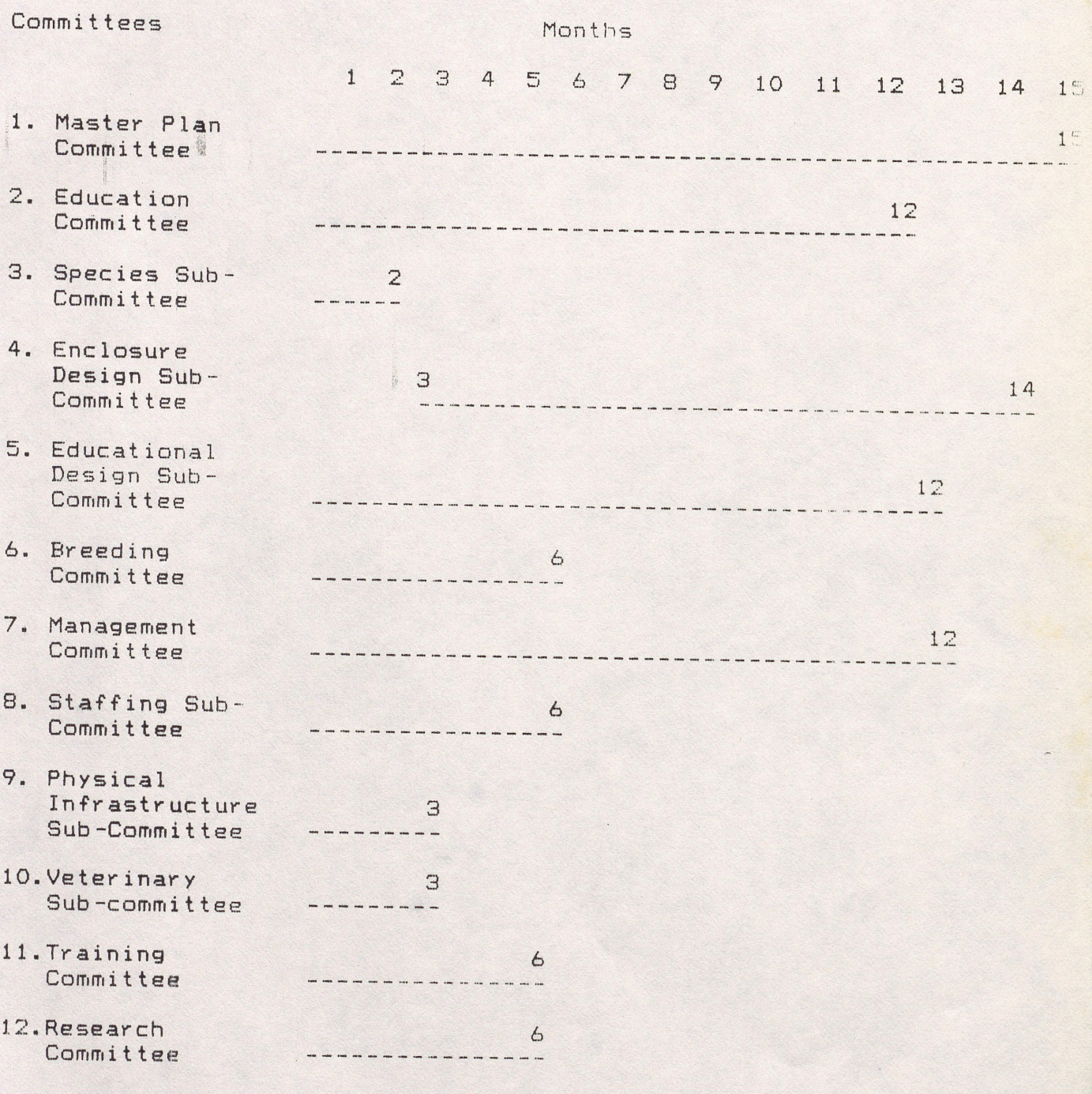
-to identify the research to be undertaken at/for the NZP and to lay down detailed procedures for the organisation of research.	6 months

NOTE: 1. The committees/sub-committees would be given detailed terms of reference based on the guidelines laid down in this document.

2. The committees will report to the Master Plan Committee which would co-ordinate the work and integrate the reports of the committees into the final master plan.

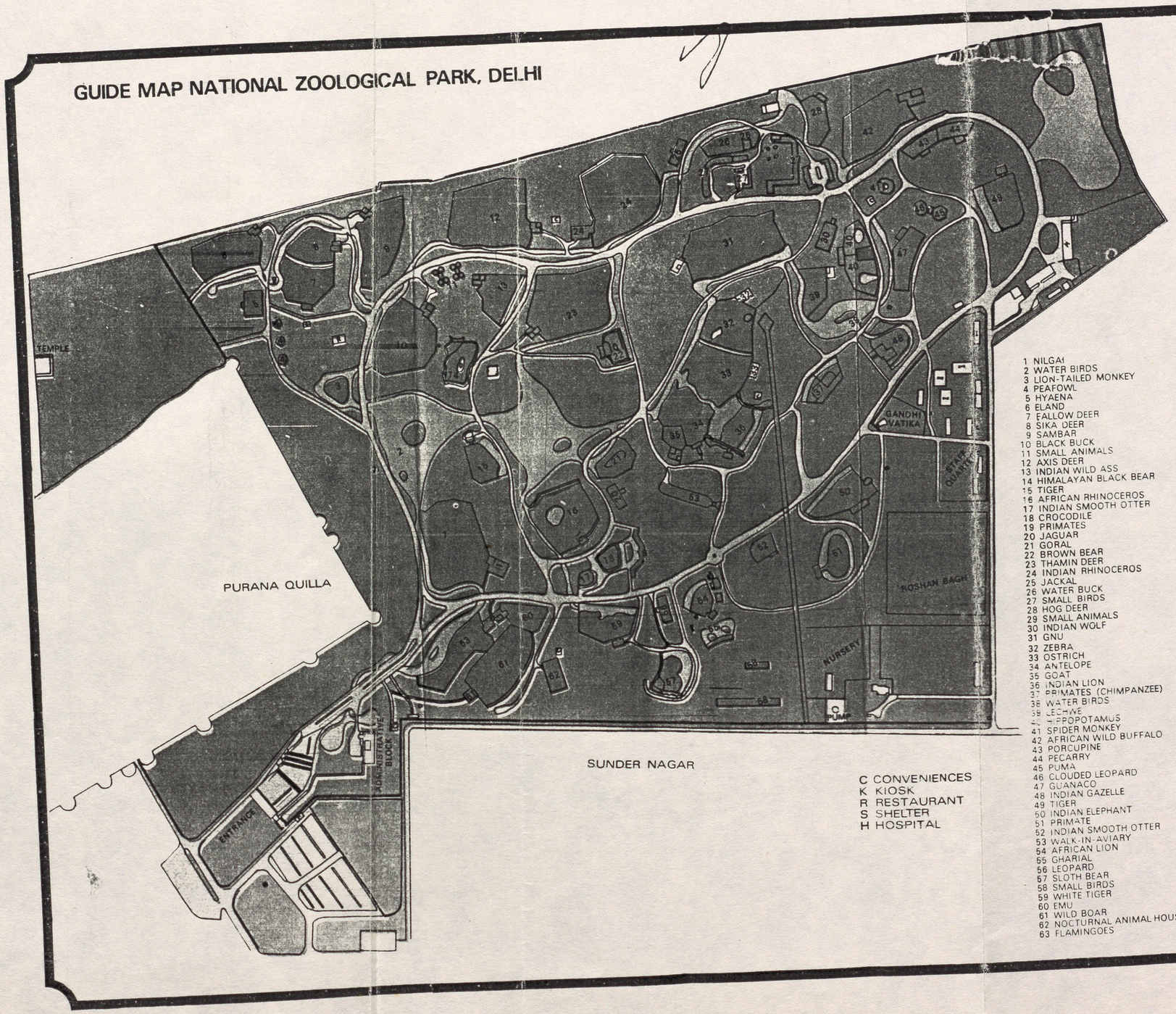
3. All other topics not allocated to a committee/sub-committee would be directly handled by the master plan committee.

TIME CHART


Committees
Months
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
1. Master Plan Committee
15
2. Education Committee
12
3. Species Sub-Committee
2
4. Enclosure Design Sub-Committee
3
14
5. Educational Design Sub-Committee
12
6. Breeding Committee
6
7. Management Committee
12
8. Staffing Sub-Committee
6
9. Physical Infrastructure Sub-Committee
3
10. Veterinary Sub-committee
3
11. Training Committee
6
12. Research Committee
6

ANNEXURES

GUIDE MAP NATIONAL ZOOLOGICAL PARK, DELHI



1 NILGAI
2 WATER BIRDS
3 LION-TAILED MONKEY
4 PEAFOWL
5 HYAENA
6 ELAND
7 FALLOW DEER
8 SIKA DEER
9 SAMBAR
10 BLACK BUCK
11 SMALL ANIMALS
12 AXIS DEER
13 INDIAN WILD ASS
14 HIMALAYAN BLACK BEAR
15 TIGER
16 AFRICAN RHINOCEROS
17 INDIAN SMOOTH OTTER
18 CROCODILE
19 PRIMATES
20 JAGUAR
21 GORAL
22 BROWN BEAR
23 THAMIN DEER
24 INDIAN RHINOCEROS
25 JACKAL
26 WATER BUCK
27 SMALL BIRDS
28 HOG DEER
29 SMALL ANIMALS
30 INDIAN WOLF
31 GNU
32 ZEBRA
33 OSTRICH
34 ANTELOPE
35 GOAT
36 INDIAN LION
37 PRIMATES (CHIMPANZEE)
38 WATER BIRDS
39 LECHWE
40 HIPPOPOTAMUS
41 SPIDER MONKEY
42 AFRICAN WILD BUFFALO
43 PORCUPINE
44 PECARRY
45 PUMA
46 CLOUDED LEOPARD
47 GUANACO
48 INDIAN GAZELLE
49 TIGER
50 INDIAN ELEPHANT
51 PRIMATE
52 INDIAN SMOOTH OTTER
53 WALK-IN-AVIARY
54 AFRICAN LION
55 GHARIAL
56 LEOPARD
57 SLOTH BEAR
58 SMALL BIRDS
59 WHITE TIGER
60 EMU
61 WILD BOAR
62 NOCTURNAL ANIMAL HOUSE
63 FLAMINGOES

C CONVENIENCES
K KIOSK
R RESTAURANT
S SHELTER
H HOSPITAL

Annexure ii

HISTORY OF THE NATIONAL ZOOLOGICAL PARK

I. PAST HISTORY AND DEVELOPMENT

1.1 Among the recommendations of the Indian Board for Wildlife at its meeting held in November, 1952 was one about setting up a modern zoological park in the country for educating people in wildlife and its conservation. Besides, there was also a long - felt need for Delhi to have a zoo.

1.2 An ad-hoc Committee was set up in July, 1953 for drawing up a preliminary scheme for the proposed park. It comprised of:

1.	Chief Commissioner, Delhi	Chairman
2.	Chairman, N.D.M.C.	Member
3.	Chairman, Railway Board	"
4.	Superintending Engineer, Delhi	"
5.	Supdt. Horticulturist, Delhi	"
6.	Supdt. Archeology, N.W. Circle	"
7.	Inspector General of Forests	"
8.	Smt. Indira Gandhi	"
9.	Maj. Genl, H. William, Army H.Q	"
10.	Mr. E.F. Bowring Walsh (PCA Delhi)	Hony. Secretary

1.3 This committee met on 9.9.53 and prepared a scheme which envisaged the construction of a park in stages. Again at its meeting on 23.11.54 it was decided that

1. The scheme would be operated by Government of India.
2. An experienced Forest Officer be appointed for the execution of the project. He would be attached to Ministry of Food and Agriculture.
3. The services of Major Weinman, Director of Zoological Garden, Ceylon be obtained under the Colombo Plan to advise on the drawing up a Plan.
4. Planning for the second phase should start concurrently and if necessary technical assistance of a foreign expert be utilised from inception.
5. The Ad-hoc Committee be dissolved and reconstituted as an Advisory Committee.

1.4 Thus, in pursuance of decisions taken at this meeting a scheme was drawn up and submitted by the Ministry of Food & Agriculture in April, 1955 to the Department of Finance for approval. The proposal was approved at the meeting held on 6.4.1955 and the post of a Superintendent, Zoological Park was created under the administrative control of the I.G.F.

1.5 This scheme, aimed at educating the public about wildlife and the need to preserve and conserve Wildlife, also aimed at breeding in the park rare species on the verge of extinction in their natural surroundings. The park was also expected to add to the attraction of the capital.

1.6 The selection of the site was done after considerable deliberation. Several alternative sites were seen, and finally three sites, one near Kutab Minar in Mehrauli, one behind the Presidential estate on the Ridge and the present site were examined with reference to proximity to visitors and supply of water, electricity etc.

1.7 Major Weinman of the Colombo Zoo was commissioned under the Colombo Plan for a period of 4 weeks in October, 1955 to examine the feasibility of establishing a Zoological Section in the proposed Zoological-cum-Botanical Park at New Delhi. The present site was finally selected by him and an area of 149.0 ha, was allocated for the Zoological-cum-Botanical Park, including the area within Purana Quila. Later, at the instance of the Archaeological Department, the entire area of the Purana Quila and a strip of land measuring 45 M. around it were left out leaving only 85.60 ha. for the park. Today there are only 74.40 ha available of which 6.4 ha. have been transferred to the Trade Fair Authority of India and another 4.80 ha. to the Delhi Development Authority for the aesthetic upliftment of the Purana Quila. Recently 4.00 ha, of jhuggi area has been cleared of juggi dwellers & thus available for use.

1.8 The services of Carl. Hagenbeck, owner of the famous Animal Park at Hamburg, Germany, were utilised to give guidance on the setting up of the Park. In his report submitted in March, 2956 he suggested the following demarcations :-

Water area	4.08 ha
Animal Enclosures	20.32 "
Buildings	1.80 "
Children's Zoo	1.80 "
Nursery	0.68 "
Roads & Paths	5.20 "
Parking area	5.72 "
Trees and Lawns	46.00 "
	85.60 "

1.9 The Chief Engineer, C.P.W.D prepared a rough estimate of the project on the basis of the report submitted by Major Weinman, which is as follows :-

1.	Dressing of site and filling in the depression	1.30 Lakh
2.	Roads and Paths	4.44 "
3.	Residential Quarters	5.15 "
4.	Animal Houses	10.89 "
5.	Open Air enclosures, shelters & caves	31.44 "
6.	Restaurant, Cafes, Children's park	8.82 "
7.	Lakes, Ponds and Waterways	30.90 "
8.	Water arrangements	4.51 "
9.	Drainage	4.51 "
10.	Miscellaneous, Car Park, etc.	1.46 "
11.	Deptt, charges 8%	8.23 "
		111.08 "

1.10 The work at the park commenced in November, 1955 by way of consolidation of the area, and its clearance for road formation. The work comprised construction of the compound wall, a few quarters, entrance gate, enclosures, water supply, electricity, road lay-out, jungle clearance and planting of trees. These works were done in the last years of the First Plan. The Central Tractor Organisation assisted in the making of roads. The works of the scheme were targeted to finish by the end of 1962.

1.11 The plan prepared by Carl Hagenbeck was revised to suit local conditions in 1959 and the subsequent development of the park was done according to the revised plan which envisaged the are distribution as follows :-

Water area	3.60 ha.
Animal Enclosures	34.00 "
Buildings	2.80 "
Nursery	0.80 "
Roads & Paths	3.20 "
Parking area	1.20 "
Trees & Lawns	40.00 "
	85.60 "

1.12 The park was inaugurated by Shri Punjab Rao Deshmukh the then Minister for Agriculture, on 1st November, 1959 and was made open to the public.

II. A FRESH LOOK AT THE ZOOLOGICAL PARK

2.1 The park has now completed 25 years of existing infrastructure is necessary. A committee was set up for the preparation of the master plan and for suggesting specific proposals, keeping in view the later concepts and technology developed in the field of Zoo Management. The members of this committee were as follows:-

1.	Joint Secretary (WL)	Chairman
2.	Duleep Mathhai	Member
3.	N.D. Bachketi	"
4.	Dr. L.M. Nath	"
5.	Dr. S.M. Nair	"
6.	Director, Horticulture	"
7.	Chief Engineer (NDZ) CPWD	"
8.	Supdt. Engineer (Civil)	"
9.	Supdt. Engineer (Elect)	"
10.	Shri Pushp Kumar	"
11.	Senior Architect, C.P.W.D.	"
12.	Director, National Zoological Park	Member Secretary

2.2 The park area is now developed except for areas totaling between 12.0 to 16.0 ha. The present area distribution of the park is approximately as follows :-

Water area	3.60 ha
Animal enclosures	30.20 "
Buildings	2.80 "
Nursery	0.80 "
Roads & Paths	3.20 "
Parking area	1.20 "
Trees & Lawns	32.60 "

2.3 Some of the important features which are to come up are the reptile house, aquarium, nocturnal house, nature park and the interpretation/visitors' centre. Besides this, some enclosures for hoofed animals, primates and pheasants are contemplated in the available space. The National Museum of Natural History is to be constructed upon the zoo premises and the two will be complementary to each other.

2.4 The committee met first on the 16th September, 1986 and thereafter on several occasions (11.12.86, 16.1.87 6.3.87, 21.4.87 8.7.87, 21.9.87 and 26.11.87) to review the existing set-up, its inadequacies and limitations and suggested improvements and alterations. These deliberations are contained in a draft Master Plan which constitutes Part-II of this document encompassing the civil works, sanitation and the administrative organisation. As regards additions and alterations, changes have been suggested.

Annexure iii

LIST OF ANIMALS IN THE NZP

Name	Type	Number
AMAZON DOUBLE YELLOW HEADED PARROT	BIRD	2
BAR-HEADED GOOSE	BIRD	26
BARE EYED COCKATOO	BIRD	3
BLACK IBIS	BIRD	2
BLACK NECK STORK	BIRD	13
BLACK PARTRIDGE	BIRD	4
BLACK STORK	BIRD	14
BLACK SWAN	BIRD	9
BLACKHEADED MUNIA	BIRD	2
BLOSSOM HEADED PARAKEET	BIRD	22
BLUE & YELLOW MACAW	BIRD	5
BLUE EYED COCKATOO	BIRD	2
BRAHMINY DUCK	BIRD	49
BRAHMINY MYNAH	BIRD	4
BUDGERIGAR	BIRD	21
BUDGERIGAR (HARLIQUIN)	BIRD	15
CATTLE EGRET	BIRD	8
COCKATEEL	BIRD	5
COMB DUCK	BIRD	18
COMMON COOT	BIRD	7
COMMON DUCK	BIRD	14
COMMON GOOSE	BIRD	61
COMMON GUINEA FOWL	BIRD	6
COMMON HEN	BIRD	8
COMMON POCHARD	BIRD	29
COMMON TEAL	BIRD	73
COTTON TEAL	BIRD	6
CROWNED CRANE	BIRD	4
DARTER OR SNAKE BIRD	BIRD	12
DEMOISELLE CRANE	BIRD	19
DOUBLE WATTLED CASSOWARY	BIRD	3
ECLECTUS PARROT	BIRD	6
EMU	BIRD	9
FISCHER'S LOVE BIRD	BIRD	1
FLAMINGO	BIRD	9
GOLDEN PHEASANT	BIRD	4
GREATER ADJUTANT STORK	BIRD	13
GREATER PIED HORNBILL	BIRD	2
GREEN MILITARY MACAW	BIRD	2
GREEN PARAKEET	BIRD	3
GREY HERON	BIRD	5
GREY JUNGLE FOWL	BIRD	5
GREY LAG GOOSE	BIRD	12
GREY PARROT	BIRD	2
GREY PARTRIDGE	BIRD	4
GREY SPOT-BILL PELICAN	BIRD	2
INDIAN MOORHEN	BIRD	30
JAPANESE FOWL	BIRD	3
KALIJ PHEASANT	BIRD	2
LARGE INDIAN PARAKEET	BIRD	15

LESSER ADJUTANT STORK	BIRD	7
LESSER SULPHUR CRESTED COCKATOO	BIRD	1
LILFORD CRANE	BIRD	12
LITTLE CORMORANT	BIRD	12
LITTLE EGRET	BIRD	8
LITTLE GREBE OR DABCHICK	BIRD	10
MALABAR BLUE WINGED PARAKEET	BIRD	3
MALLARD	BIRD	6
MUSCOVY DUCK	BIRD	3
MUTE SWAN	BIRD	3
NICOBAR PIGEON	BIRD	1
NORTHERN HILL MYNAH	BIRD	12
OSTRICH	BIRD	3
PAINTED STORK	BIRD	30
PALM COCKATOO	BIRD	2
PARIAH KITE	BIRD	1
PEACH FACED LOVE BIRD	BIRD	2
PEAFOWL (ORDINARY)	BIRD	4
PIGEON SHIRAZI	BIRD	2
PIN TAIL DUCK	BIRD	27
PURPLE HERON	BIRD	3
PURPLE MOORHEN	BIRD	4
RAINBOW LORIKEET	BIRD	1
RED & YELLOW MACAW	BIRD	2
RED BREASTED PARAKEET	BIRD	8
RED CRESTED POCHARD	BIRD	9
RED JUNGLE FOWL	BIRD	4
RED MUNIA	BIRD	8
RED WATTLED LAPWING	BIRD	1
REDBILLED BLUE MAGPIE	BIRD	9
REDHEADED BUNTING	BIRD	33
RING NECKED PHEASANT	BIRD	2
ROSE BREASTED COCKATOO	BIRD	4
ROSY PELICAN	BIRD	25
SARUS CRANE	BIRD	2
SCARLET IBIS	BIRD	1
SENAGAL PARROT	BIRD	2
SHOVELLER DUCK	BIRD	28
SILVER PHEASANT	BIRD	4
SPOON BILL	BIRD	9
SPOTTED MUNIA	BIRD	8
SULPHUR CRESTED COCKATOO	BIRD	2
TUFTED POCHARD	BIRD	6
WHISTLING TEAL	BIRD	9
WHITE BREASTED WATER HEN	BIRD	12
WHITE FAN TAILED PIGEON	BIRD	6
WHITE IBIS	BIRD	41
WHITE NECKED STORK	BIRD	15
WHITE PEA FOWL	BIRD	4
WHITE STORK	BIRD	18
WHITE THROATED MUNIA	BIRD	5
WHITE-EYED POCHARD	BIRD	13
WHITECRESTED LAUGHING TRUSH	BIRD	10
WHITETHROATED LAUGHING THRUSH	BIRD	11
WIDGEON TEAL	BIRD	16
YELLOW HEADED AMAZON PARROT	BIRD	1

AFRICAN BLACK RHINOCEROS	MAMMAL	2
AMERICAN BLACK BEAR	MAMMAL	2
ASIATIC WILD ASS	MAMMAL	2
ASSAMESE MONKEY	MAMMAL	7
BARKING DEER	MAMMAL	7
BINTURONG (BEAR CAT)	MAMMAL	2
BLACK BUCK	MAMMAL	16
BLACK BUCK (WHITE)	MAMMAL	3
BLACK PANTHER	MAMMAL	2
BONNET MACAQUE	MAMMAL	11
BROW-ANTLERED DEER	MAMMAL	16
CAPE BUFFALO	MAMMAL	5
CAPPED LANGUR	MAMMAL	1
CAPUCHIN	MAMMAL	2
CHIMPANZEE	MAMMAL	2
CHINKARA	MAMMAL	2
CHIMPANZEE	MAMMAL	2
CHINKARA	MAMMAL	16
DESERT FOX	MAMMAL	2
DRILL MONKEY	MAMMAL	1
ELAND	MAMMAL	5
FALLOW DEER	MAMMAL	2
GHORAL	MAMMAL	7
GUINEA PIG	MAMMAL	26
HAMADRYAS BABOON	MAMMAL	6
HANUMAN LANGUR	MAMMAL	6
HIMALAYAN BLACK BEAR	MAMMAL	4
HIPPOPOTAMUS	MAMMAL	3
HOG DEER	MAMMAL	8
INDIAN ELEPHANT	MAMMAL	4
INDIAN FOX	MAMMAL	2
INDIAN JACKAL	MAMMAL	4
INDIAN LION	MAMMAL	6
INDIAN PORCUPINCE	MAMMAL	7
INDIAN RHINOCEROS	MAMMAL	2
JAGUAR	MAMMAL	2
JAPANESE BROWN BEAR	MAMMAL	2
JAVA MONKEY	MAMMAL	3
JUNGLE CAT	MAMMAL	1
KINKAJOUS	MAMMAL	5
LADAKI GOAT	MAMMAL	1
LION	MAMMAL	1
LION-TAILED MACAQUE	MAMMAL	17
MALAYAN BEAR	MAMMAL	2
NILGAI	MAMMAL	28
NILGIRI LANGUR	MAMMAL	3
NILGIRI TAHR	MAMMAL	1
OLIVE BABOON	MAMMAL	1
ONE HUMPED CAMEL	MAMMAL	1
ORANGUTAN	MAMMAL	2
PANTHER/LEOPARD	MAMMAL	2
PIG-TAILED MONKEY	MAMMAL	2
PUMA	MAMMAL	1
RABBIT	MAMMAL	18
RED FOX	MAMMAL	2
RED LACHWE	MAMMAL	4
RHESUS MACAQUE	MAMMAL	5

SAMBAR	MAMMAL	13
SIKA DEER	MAMMAL	4
SLOTH BEAR	MAMMAL	8
SMALL INDIAN CIVET	MAMMAL	5
SMOOTH INDIAN OTTER	MAMMAL	6
SOOTY MANGABEY	MAMMAL	3
SPIDER MONKEY	MAMMAL	1
SPOTTED DEER	MAMMAL	19
STRIPED HYAENA	MAMMAL	3
STUMP-TAILED MACAQUE	MAMMAL	1
SYKES GUENON	MAMMAL	1
TIGER	MAMMAL	8
WATER BUCK	MAMMAL	5
WHITE TIGER	MAMMAL	4
WILD BOAR	MAMMAL	23
WOLF	MAMMAL	2
EASTERN HILL TORTOISE	REPTILE	1
GHARIAL	REPTILE	3
INDIAN MUD TURTLE	REPTILE	8
MUGGER	REPTILE	7
PYTHON	REPTILE	2
STARRED TORTOISE	REPTILE	1

Annexure iv

DETAILED PROFILE OF THE NZP

4.1.1 ANIMAL SECTION

4.1.1.1. The enclosures were originally built on a geographical distribution pattern of display as far as practicable, but in due course they got mixed up due to exigencies of accommodating animals as and when they were procured, or when any enclosures became vacant.

4.1.1.2. There are 52 enclosures with moats and 19 structures having 144 cages housing the following stock as on 1.11.87

	Order	Family	Species	Specimens
Mammals	8	21	66	385
Birds	16	23	99	1242
Reptiles	4	4	5	20
	28	48	170	1647

4.1.1.3 These enclosures are divided into 19 beats manned by the following staff :-

Zoo Ranger	2
Head Animal Keepers	2
Zoo Keeper	24
Asstt. Keeper	36
Mahouts	2
Attendants	7

4.1.1.4 Some of the enclosures, cages and animal houses which have been built over the past years are now inadequate or antiquated. They need to be either altered or demolished and reconstructed.

- The cages for the monkeys and the birds where the available space is inadequate for their physical and biological needs and security from the visitors, and from one another, require to be demolished and reconstructed or restructured with due provisions for hygiene and space, as well as protection from inclement weather, vermin and reptiles.

- A few of the animal houses of the herbivores, primates and birds require to be repaired, redesigned and restructured as the existing partitions are unsuitable. The sliding doors of 38 cages require replacement or redesigning to prevent accidental escape of animals. These are being set right.

- Five houses of carnivores/omnivores are in a poor state. They require repair, enlargement, reflooring and in case of nine cages, provision of attached squeeze cages as they do not exist at present. This too is being redressed.

- Bars and meshings of some cages need to be replaced since they have rusted beyond repairs. The replacements are being carried out.

- Some enclosures/cages are very small as those of the brown bear, leopard, sloth bear and himalayan black bear. One cubicle of the brown bear night house has been widened. Others would also be enlarged.

- The flooring in some of the animal houses are of wooden batten which are saturated with urine, faeces and other organic wastes. They need to be replaced by R.C.C. flooring with movable wooden battens placed over it. This is particularly required for the houses of the white tiger and the Indian lions. Such work has already been done in the houses of the two tiger houses.

- There are some cages, particularly of monkeys and birds, which do not have night houses and they are therefore exposed to the elements. These cages need to be provided with protective night houses.

- Some of the peripheral walls of enclosures are flat and smooth and hence are being used by visitors for resting. This is the case with the enclosures of the otter, crocodile, chinkara, hippo and the guanaco. The walls of the chimpanzee, orangutan, malayan bear, brown bear, white tiger enclosures have however been rectified by reducing the height and making their surface jagged and undulating with a natural exterior. The others too will be treated similarly.

- Cage furnishing has been done in all the bird, monkey, bear and small animal enclosures to provide climbing and perching place to their occupants. This however needs to be done more elaborately. This work is in progress.

- Repair to the collapsed moat walls of the Rhino and Cape Buffalo has commenced. Repairs to other moat walls need to be done on priority in the case of the chinkara, eland and sambar.

4.1.1.5 The animals exhibited at present are not truly representative. Many smaller and uncommon zoo bred animals could be exhibited. The list of animals presently in the zoo is given in Appendix III. There are many species the specimens of which have become too old to breed, or have become single or are of the same sex. This is a serious problem with the primates, leopards, jaguars, lions & pumas.

4.1.2 VETERINARY SECTION

4.1.2.1 A hospital complex has been constructed with quarantine facilities, cages for patients, a post mortem room, an operation theatre, a laboratory for diagnostic testing and pathological examination of faecal matter, urine, blood etc. Two specially designed squeeze-cages for multiple use are also blow pipes and tranquilising guns. However for setting up a model Veterinary Medical Unit in the Zoo, more equipment requires to be added to update the existing facilities for post mortem, quarantine and isolation wards.

4.1.2.2 Presently the hospital has the following staff :-

1.	Veterinarian	1
2.	Compounder	1
3.	Laboratory Assistant	1
4.	Dresser	1
5.	Attendants	5

4.1.2.2 The Veterinarian and Zoo Ranger are trained in use of blow pipe and tranquilizer gun.

4.1.3 GARDEN SECTION

4.1.3.1 The area under this section has been constantly shrinking with the establishments of new animal enclosures. The area is presently 32.60 ha. of which 11.40 ha. are undeveloped and are distributed as follows:-

Roshan Bagh	1.20 ha
Jhuggi area	4.00 "
NMNH area	2.00 "
Behind hospital	1.20 "
Between Rhino/Spotted deer	1.0 "
Along Quila	2.0 "

The developed area is as follows :-

Formal Garden	2.40 ha
Informal Garden	18.00 "
Rose Garden	0.40 "
Nursery	0.40 "

Trees - 3600 old + 2000 new
Hedges - 5630 running meters
Potted plants - 5000
Shrubs - 6000

The section is managed by the following staff :-

Garden Superintendent -	(Presently on de putation)
Works Supervisor	1
Zoo Guards	4
Malies	75

4.1.3.2 This park was conceived as a Zoological-cum-Botanical Park. Over 450 species, including a few subtropical species of trees, shrubs and climbers both wild and cultivated, of native and exotic origin, had been established.

4.1.3.3 This year it had been decided to allow most of the undeveloped area to remain untouched except for the eradication of parthenium and cannabis. It is planned to allow trees to remain as a buffer from external noise, particularly from the railway line. The natural vegetation also serves as a habitat for the free ranging resident and migratory land birds as well as small mammals.

4.1.4 SANITARY SECTION

4.1.4.1 This section is staffed as follows :-

1.	Sanitary Inspector	1
2.	Zoo Guard	1
3.	Gangmen	11
4.	Asstt. Keeper	13

4.1.4.2 The section is equipped with a bullock cart for collection and removal of animal and garden refuse from various collection points. It maintains 5 convenience stations, 15 shelters 20 drinking water points, 60 dustbins for use of visitors. Besides, it has the responsibility of keeping clean 10 km of roads and 8 km. of moats. Nearly 5.0 tonnes of garbage made of about 120 kg of bones, 150 kg of other left over feed. 2000 kg of dung & faeces, 2700 kg of garden waste and miscellaneous products is removed daily from the park. Some of this waste would be utilized in a biogas plant and the rest incinerated. The section also attends to malaria, rodent and predator control measures in the enclosures and the residential complex.

4.1.4.3 This section is inadequate keeping in view of increase in the number of visitors.

4.1.5 EDUCATION & RESEARCH

4.1.5.1 The park caters of over 12 lakh visitors annually and serves as a centre for educating people about environmental concerns and conservation of wildlife, especially the endangered species.

4.1.5.2 Guided tours are conducted by Biological/Education Assistants and Zoo Rangers, particularly for school children as also for other groups requesting for specific information about the zoo and its role in conservation. Such groups usually include those from the Army, the Forest Colleges, the Wildlife Institute of India and the Veterinary Colleges.

4.1.5.3 Slide shows and lectures are organised for institutions on request.

4.1.5.4 On-the-spot painting competition are conducted for school children on wildlife and related topics and films are shown to the public during the Wildlife Week.

4.1.5.5 Technical seminars/workshops are sometimes conducted on modern techniques and development of zoos.

4.1.5.6 One-month training programmes for animal keepers conducted by senior staff of the zoo have been started for introducing them to better zoo management, practices and care of animals.

4.1.5.7 Veterinary graduates of the Hissar Agriculture University were associated with the zoo for a part of their internship training during this year.

4.1.5.8 Research facilities are extended whenever they are sought to students for their Masters and Doctoral; research work in Wildlife.

4.1.5.9 Nature photography by both amateurs and professionals is encouraged by giving them facilities and cooperation.

4.1.5.10 Animal enclosures have been labeled both in English and Hindi giving the common name and origin of each animal. A new approach to labeling has been recently adopted, highlighting salient features of the animals with pictures and descriptions. Maps and directional signs have been provided to guide the visitors. The first phase of this new labeling and signages has been completed. The work on the second stage of installation of signs is yet to begin.

4.1.5.11 Information about the animals like births, deaths and important features is collected and recorded. During this year a permanent register called "Observation Notes" have been kept for each species for recording important observations on all behavioural aspects noted by the zoo staff. This is expected to provide valuable data for research.

4.1.5.12 Existing staff

Curator (Education)	1	(Vacant)
Biological Assistant	1	
Education Assistant	3	(1 post vacant)
Librarian	1	(Vacant)
Peon/Attendant	1	

4.1.6 WORKSHOP SECTION

4.1.6.1 This section has the following staff :-

Blacksmith	1
Carpenter	1
Painter	1
Attendants	4

4.1.6.2 The workshop staff attend to day to day work of routine maintenance and emergencies.

4.1.6.3 Electrical, plumbing and masonry works are entrusted to the C.P.W.D. This has unfortunately been a great handicap as the lengthy procedure of obtaining their services often precludes paying prompt attention to even minor works.

4.1.7 STORES AND KITCHEN

4.1.7.1 There is a kitchen (7.8Mx5.7M), two store-rooms (60x3.9x1.5M and 5.7x3.6M) and a covered area (5.4x4.5M) with two tanks (2.4x1.5x0.45M and 1.5x1.0x0.45M) for preparing mash and soaking of gram, and a weighing machine of 500kg capacity. The kitchen is provided with tiled walls and a cooking platform (7.2x0.6M) along these walls. A hot water geyser, 2 ovens and a wash basin are also provided. The kitchen is protected with fly proof meshing and has two exhaust fans. The stores are also protected from flies and rodents.

4.1.7.2 A meat-room (6.60x4.20M) is provided for receiving and distributing meat. It has a spring balance, a water tank and a geyser. It has a cold storage (6.60x1.80x3.60M high) attached with hooks and shelves. It has a capacity of 3 tonnes. Meat can be kept in it upto 2-3 days in an emergency.

4.1.7.3 In addition, there are 6 store rooms for storing miscellaneous items for general maintenance.

4.1.7.4 The store area is provided with 2 platform weigh bridges of 1000 kg and 10,000 kg capacity.

Annexure v

Educational Game

Thsi an example of the sort of game, adapted to Indian conditions, that can be organised for children as part of the educational activities in the NZP.

OH DEER !

Objectives Students will be able to :

1) identify and describe food, water, and shelter as three essential components of habitat;

2) describe the importance of good habitat for animals;

3) define "limiting factors" and give examples; and

4) recognize that some fluctuations in wildlife populations are natural as ecological systems undergo a constant change.

Method Students become "deer" and components of habitat in a highly-involving physical activity.

Background A variety of factors affects the ability of wildlife to successfully reproduce and to maintain their populations over time. Disease, predator/prey relationships, varying impacts of weather conditions from season to season e.g., early freezing, heavy snows, flooding, drought), accidents, environmental pollution, and habitat destruction and degradation are among these factors.

Some limiting factors serve to prevent wildlife populations from reproducing in numbers greater than their habitat can support. An excess of such limiting factors, however, leads to threatening, endangering, and eliminating whole species of animals.

The most fundamental of life's necessities for any animal are food, water, shelter, and space in suitable arrangement. Without these essential components, animals cannot survive.

This activity is designed for students to learn that :

a) good habitat is the key to wildlife survival;
b) a population will continue to increase in size until some limiting factors are imposed;
c) limiting factors contribute to fluctuations in wildlife populations; and
d) nature is never is "balance", but is constantly changing.

The major purpose of this activity is for students to understand the importance of good habitat as well as factors that affect wildlife populations in constantly changing ecosystems.

Materials area - either indoors or outdoors - large enough for students to run; e.g., playing field; chalkboard or flip chart; writing materials

Procedure

1. Begin by telling students that they are about to participate in an activity that emphasizes the most essential things that animals need in order to survive. Review the essential components of habitat with the students: food, water, shelter, and space in a suitable arrangement. This activity emphasizes three of those habitat components - food, water, and shelter - but the students should not forget the importance of the animals having sufficient space in which to live, and that all the components have to be in a suitable arrangement or the animals will die.

2. Ask your students to count off in four's. Have all the one's go to one area; all two's, three's, and four's go together to another area. Mark two parallel lines on the ground or floor ten to 20 yards apart. Have the one's line up behind one line; the rest of the students line up behind the other line.

3. The one's become "deer". All deer need good habitat in order to survive. Ask the students what the essential components of habitat are again : food, water, shelter, and space in a suitable arrangement. For the purposes of this activity, we will assume that the deer have enough space in which to live. We are emphasizing food, water, and shelter in order to survive. When a deer is looking for food, it should clamp its hands over its stomach. When it is looking for water, it puts its hands over its mouth. When it is looking for shelter, it holds its hands together over its head. A deer can choose to look for any one of its needs during each round or segment of the activity; the deer cannot, however, change what it is looking for; e.g., when it sees what is available, during that round. It can change again what it is looking for in the next round, if it survives.

4. The two's, three's, and four's are food, water, and shelter - components of habitat. Each student gets to choose at the beginning of each round which component he or she will be during that round. The students depict which component they are in the same way the deer show what they are looking for; that is, hands on stomach for food, etc.

5. The game starts with all players lined up on their respective lines (deer on one side; habitat components on the other side) - and with their backs to the students at the other line.

6. The facilitator or teacher begins the first round by asking all of the students to make their signs - each deer deciding what it is looking for, each habitat component deciding what it is. Give the students a few moments to get their hands in place - over stomachs, mouths, or over their heads. As you look at the two lines of students, you will normally see a lot of variety - with some students water, some food, some shelter. As the game proceeds, sometimes the students confer with each other and all make the same sign. That's okay, although don't encourage it. For example, all the students in habitat might decide to be shelter. That could represent a drought year with no available food or water.)

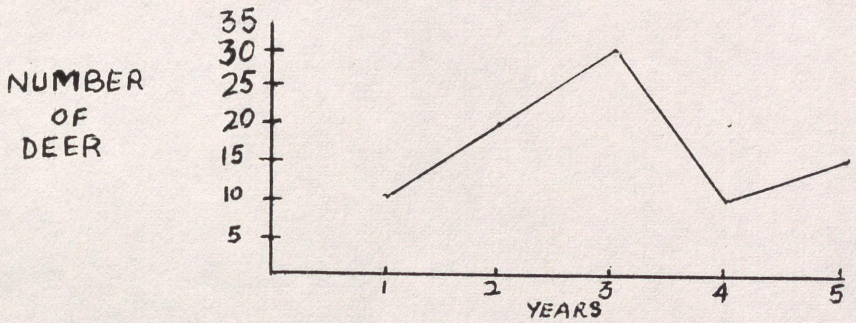
7. When you can see that the students are ready. count "One... two... three". At the count of three, each deer and each habitat component turn to face the opposite group, continuing to hold their signs clearly.

8. When deer see the habitat component they need, they are to run to it. Each deer must hold the sign of what it is looking for until getting to the habitat component person with the same sign. Each deer that reaches its necessary habitat component takes the "food", "water", or "shelter" back to the deer side of the line. This is to represent the deer's successfully meeting its needs, and successfully reproducing as a result. Any deer that fails to find its food, water, or shelter dies and becomes part of the habitat. That is, in the next round, the deer that died is a habitat component and so is available as food, water, or shelter to the deer who are still alive. NOTE : When more than one deer reaches a habitat component, the student who gets there first survives. Habitat components stay in place on their line until a deer needs them. If no deer needs a particular habitat component during a round, the habitat component just stays where it is in the habitat. The habitat person can, however, change which component it is from round to round.

9. You as the facilitator or teacher keep track of how many deer there are at the beginning of the game, and at the end of each round you record the number of deer also. Continue the game for approximately 15 rounds. Keep the pace brisk, and the students will thoroughly enjoy it.

10. At the end of the 15 rounds, gather the students together to discuss the activity. Encourage them to talk about what they experienced and saw. For example, they saw a small herd of deer (seven students in a class size of 28) begin by finding more than enough of its habitat needs. The population of deer expanded over two to three rounds of the game, until the habitat was depleted and there was not sufficient food, water, and shelter for all the members of the herd. At that point, deer starved or died of thirst or lack of shelter, and they returned as part of the habitat. Such things happen in nature also.

11. Using a flip chart pad or an available chalkboard, post the data recorded during the game. The number of deer at the beginning of the game and at the end of each round represent the number of deer in a series of years. That is, the beginning of the game is year one; each round is an additional year. Deer can be posted by five's for convenience. For example:



The students will see this visual reminder of what they experienced during the game: the deer population fluctuated over a period of years. This is a natural process, as long as the factors which limit the population do not become excessive, to the point where the animals cannot successfully reproduce. The wildlife populations will tend to peak and rebuild, peak and rebuild, as long as there is good habitat and sufficient numbers of animals to successfully reproduce.

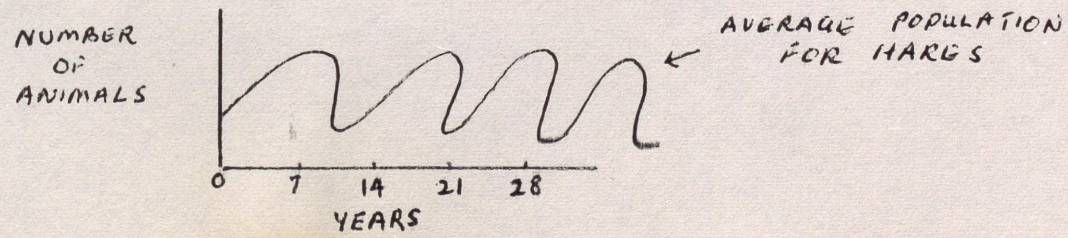
12. In discussion, ask the students to summarize some of the things they have learned from this activity. What do animals need to survive ? What are some of the "limiting factors" that affect their survival ? Are wildlife populations static, or do they tend to fluctuate, as part of an overall "balance of nature?" Is nature ever really in "Balance", or are ecological systems involved in a process of constant change ?

Extensions

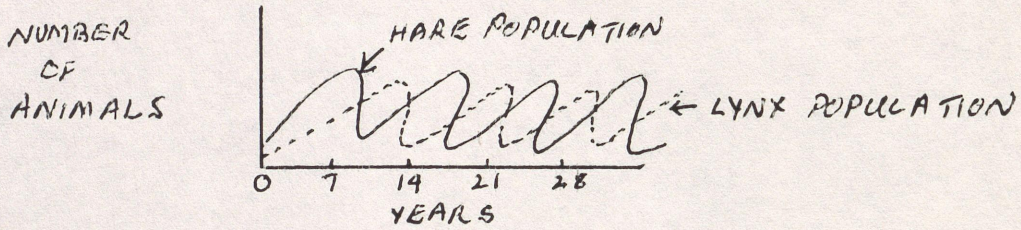
1. When you have finished tabulating the graph data and discussing it, ask the students if they have ever heard of the Hudson Bay trappers in American history. Tell them, briefly, who they were.

There is a hundred years, or more, of records of the activities of these trappers. In those records are some interesting data. These data refer to pelts shipped from America to Europe, particularly the pelts of snowshoe hares and lynx.

Researchers have found that snowshoe hare populations seem to peak about every seven to nine years and then crash, repeating the process over each comparable time period. So, a snowshoe hare population graph would look like this:



It has also been discovered that lynx populations do the same thing - except that they do it one year behind the hare populations. The combined graph would look like this :



Graph this right over the deer graph that you made, adding first the hares, and then the lynx.
Ask the students :
. Which animal is the predator ? Which prey ?
. Are predators controlling the prey, or are prey controlling the predators ? (We have been brought up to "know" that predators control the prey - and are how discovering that this is not so. The number of prey animals available tells us how many predators can live in the area.
. Is this like the deer habitat game we just played ? Who controls ? (Sometimes the habitat - when the deer population is not too large; sometimes the habitat - what the deer population "gets on top of it" and destroys the vegetative food and cover.)

2. Some recent research has added a new dimension to the story of the snowshoe hares and the lynx.

It has been found that the major food of the hare is a small willow. As hare populations grow, the use of the willow plants grows too. But, when the willow plant has been "hedged" or eaten back so far, the plant generates a toxin (poison) which precludes use by the hare. That is when the hare population crashes, followed by the crash of the lynx population about a year later. Then the willow, relieved or pressure, begins to grow again. The hare population begins to grow in response, and last of all, within a year or so, the lynx population follows. And the cycle has begun again - over and over - every seven to nine years.

Discuss the "balance of nature". Is it ever in "balance ?"

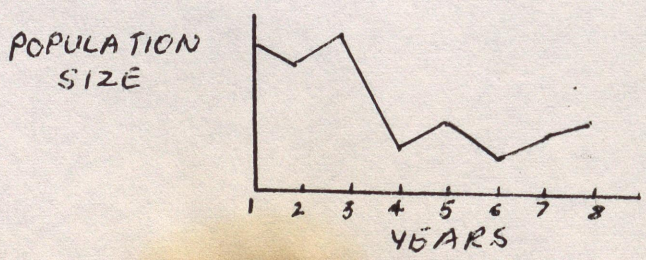
Evaluation

Name three essential components of habitat.

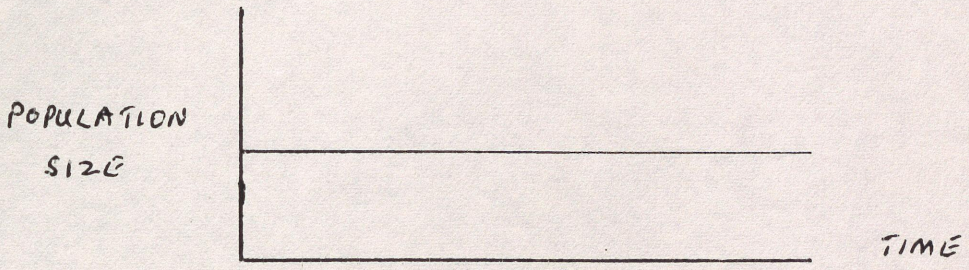
Define "limiting factors". Give three examples.

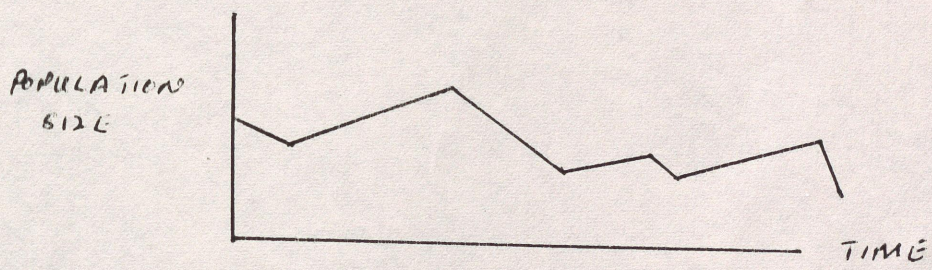
Examine the graph. What factors may have caused the following population changes

a. between years 1 and 2?
b. between years 3 and 4?
c. between years 5 and 6?
d. between years 7 and 8?



Which of the following graphs represents the more typically balanced population ?





Annexure vi

Some Comments Regarding the Design of Enclosures

"Providing a number of selected views into outdoor exhibits rather than creating a continuous view along the perimeter, as is so often done even with newer exhibits (is recommended). Selected views enhance visitor interest as well as provide the best positions for seeing animals. Care should be taken to eliminate the distraction of cross-viewing other people and exhibits either by screening or by restricting the width of view. All animals should be seen at or above the visitor's eye level. This not only improves viewing but is less intimidating for animals. There is the need to provide at least one major view location for interpretation of each exhibit which could be used by all age groups and the handicapped.

"Viewing of many species can be a great deal more exciting and meaningful if not limited to ground level. For example, there exists and excellent exhibit in the Taronga Zoo in Sydney consisting simply of a wooden ramp that curves upwards to tree-top level past Koalas feeding on eucalyptus branches, and continues to arc gently down to ground level again. Th cost involved to construct the ramp is not substantial in relation to the benefit visitors gain by having an opportunity to appreciate the animals at their own level and in their own environment. Similarly, the Arizona-Sonora Desert Museum has become famous for providing visitors with views of several animals in burrowing chambers below ground and has now extended this approach to include a walk-through cave.

"One of the most interesting approaches to animals viewing not yet incorporated into zoos is to be found at Salt Lick Lodge in Tsavo National Park, Kenya. In addition to providing the usual distant view of an assortment of wildlife drinking at a waterhole, they have given the visitor an opportunity to come into more intimate contact with the animals without disturbing them. They have dome this by laying down a culvert pipe below ground which is large enough for the public to walk through. A few lights and a bit of carpeting make the passage quite acceptable. The culvert terminates in turret beside the waterhole just a few inches above ground level. From here the visitor has a dramatic view of the wildlife at sometimes little more than touching distance. From the animals' point of view, because they cannot see the people, they are neither intimidated nor frightened. The turret, being restricted to an inferior position in height, further helps in enabling the animals to feel at ease. Translated into the zoo context, such an approach means that it would be possible to construct large, spacious exhibits that would not limit visitors to distant viewing. Obviously care must be taken in choosing the right point or points where close contact can be assured.

"In most zoos medium-sized mammals are publicly displayed in a series of cube-shaped, small room-sized cages. All wall faces are flat and easy to clean. Cage fronts usually consist of either glass or wire mesh. Cage furniture is restricted to one or two items that enable the animals to either climb, swing, claw, rub against, bate or hide in. A food dish, if there is one, is commonly on view.

"In general, improvements on this concept have been modest, such as pointing a diorama along the back and side walls, curving the back wall to eliminate harsh lines and supplementing the cage furniture with natural materials. Only a few zoos are as yet making radical departures from the old concept. The series of Minnesota wildlife exhibits at the **Minnesota State Zoo** is one such example. The cages have been stretched into the equivalent of long hallways, giving the animals considerably increased distance over which they can travel, yet ensuring that they remain in close proximity to the public. The back and side walls have been replaced with simulated rockwork. While the animals can negotiate most of its surface, allowance has been made to incorporate paths into the rockwork that look natural and are regularly used by the inhabitants. **The sloping terrain facilitates cleaning.** Windfalls, flowing water and plan cover in the form of low shrubs, where applicable, are incorporated into the design. Interestingly, the animals are out-of doors while the public is indoors, behind a barrier of glass.

"Comprehension of the animal's world is further enhanced by providing a close dramatic view into more than one aspect of its environment. For example, the river otter can be seen either scampering around its terrestrial habitat or swimming under water in a natural setting. Care has been taken to see that the water surface is visible, as much of the activity occurs at or close to it. **The Zurich Zoo** has gone one step further by including within its otter exhibit an underground sleeping den. Since some thoughtless visitors will always try to awaken the animals by tapping on the glass, two layers of glass have been used.

"Two other examples of exhibits that show more than one aspect of an animal's life are the margay and fishing cat enclosures at the **Brookfield Zoo in Chicago.** A simulated forest canopy within the margay exhibit provides a marvelous setting for displaying the arboreal attributes of these cats as contrasted with their behavior on the ground. In the fishing cat exhibit, small pools along a simulated stream bottom are stocked with minnows, providing a rare opportunity for cats to display natural hunting behavior in a zoo setting. The range of activities which can be exhibited for any given species is limited mainly by depth of understanding and extent of ingenuity." (Joslin, P.; undated)

"Exhibiting animals in a manner that visually closely simulates the natural environment and that adequately interfaces the public with the animals without stressing the latter has become a highly sophisticated science." (Joslin, P.; 1988A)

"It is recommended that considerable effort be put into the development of mixed exhibits. This would provide a richer visual experience than single species exhibits as well as more closely reflect the natural environment which one is usually trying to portray .

"Efforts should be made to juxtaposition predator and prey in adjoining exhibits." (Doherty,J.G. as reported in Joslin,P.; 1988B)

"Note : There are many ways to heighten the impact on the public of the animals being viewed without increasing the stress level. The animals can be viewed from behind a blind when very close viewing is required. The choice of animals can favour those that do best in social groups, or mixed species groups, and are not particularly sensitive to being seen by the public. Choosing brightly colored, diurnally active or otherwise conspicuous animals also helps. Avoiding the concept of a continuous line of repeative exhibits in favour of highly imaginative exhibits offerning viewing at a few optimally selected points unincumbered either by seeing of neighboring exhibits, architectural structures or people further helps to draw attention to the subject at hand." (Joslin, P.; 1988B)

"As far as possible man made barriers and the buildings should be hidden by careful landscaping and planting schemes. The principles behind this sort of design are well known and advice is readily availabe on these matters, although much of it is largely a matter of common sense." (Jones, D.M.; 1988)

Annexure vii

SUMMARY OF THE VISITORS DATA

Location : NATIONAL ZOOLOGICAL PARK, NEW DELHI.

TABLE -I

SOURCE OF VISITORS		%
1.	Delhities	39.35
2.	Other States	50.17
3.	Foreigner	10.15

TABLE -II

COMMUNITY STRUCTURE

1.	Hindu	85.02
2.	Muslims	5.25
3.	Sikh	2.25
4.	Christians	4.40

TABLE -III

FAMILY SIZE

1.	Single	26.87
2.	2	14.05
3.	3	18.00
4.	4	15.82
5.	5	14.75
6.	6-8	6.87
7.	9-12	- - -

TABLE -IV

INCOME PER MONTH (in Rupees)

1.	Nil	- - - -	00.00
2.	01-100	- - - -	9.07
3.	101-200	- - - -	- - -
4.	201-500	- - - -	3.37
5.	501-800	- - - -	8.90
6.	801-1200	- - - -	28.20
7.	1201-1600	- - - -	17.87
8.	Over 1600	- - - -	33.05

TABLE -V

OCCUPATION

1.	Unemployed	- - - -	4.40
2.	Student	- - - -	17.10
3.	Labourer	- - - -	1.07
4.	Govt. Servant	- - - -	31.65
5.	Business	- - - -	22.47
6.	Professional	- - - -	3.42
7.	Other	- - - -	18.20

TABLE -VI

EDUCATIONAL STATUS

1.	Illiterate	- - - -	1.12
2.	Under Matric	- - - -	22.55
3.	Matric	- - - -	26.60
4.	Graduate	- - - -	42.08
5.	Post Graduate	- - - -	7.08
6.	Professional	- - - -	1.12

TABLE -VII

MODE OF COMING TO ZOO

1.	Bus - - - -	38.27
2.	Scooter/M.Cycle - -	21.00
3.	Car/Van - - - -	23.25
4.	Walking - - - -	26.35

TABLE-VIII

AMOUNT SPENT

1.	Less than Rs.5/- - -	23.52
2.	Rs.5/- to Rs.10/- - -	18.67
3.	Rs.11/- to Rs.20/- -	27.77
4.	Rs.21/- to Rs.30/- -	18.70
5.	Rs.31/- to Rs.40/- -	3.55
6.	Rs.41/- to Rs.50/- -	3.40

TABLE -IX

TIME SPENT

1.	Less than 1 hour -	- - -
2.	1 to 2 hours - - - -	38.02
3.	2-3 hours - - - -	39.75
4.	3-4 hours - - - -	14.72
5.	4-5 hours - - - -	4.67
6.	Over 5 hours - - - -	2.37

TABLE -X

FAVOURITE RECREATION

1.	Pictures - - - -	26.77
2.	Gossiping - - - -	11.42
3.	Reading - - - -	36.37
4.	Games - - - -	24.97

TABLE -XI

SOCIAL GROUPS

1.	Family	- - - -	42.40
2.	Friends	- - - -	26.82
3.	Individual	- - - -	31.92

TABLE-XII

NATURE OF VISIT

1.	Recreation	- - - -	38.45
2.	Education	- - - -	18.47
3.	Tourist	- - - -	26.80
4.	Just like that	- - -	18.95
5.	Nothing to do	- - - -	12.00

TABLE-XIII

FAVOURITE COLOUR

1.	Red	- - - -	18.77
2.	Green	- - - -	24.00
3.	Blue	- - - -	13.00
4.	White	- - - -	16.37
5.	Sky Blue	- - - -	7.32
6.	Other	- - - -	18.60

TABLE-XIV

AMOUNT SPENT ON RECREATION

Less than Rs.5/-	
6-10	9.32
11-15	8.25
16-20	-
21-30	13.97
31-40	8.20
41-50	25.19
51-100	34.47

TABLE-XV

MENTAL RELAXATION

1.	Relaxed	- - - -	69.67
2.	Enlighted	- - - -	19.27
3.	Not impressed	- - - -	10.25

TABLE-XVI

EXTRA FACILITIES SUGGESTED

1.	Ride	- - - -	15.25
2.	Minibus	- - - -	18.57
3.	Signage	- - - -	24.02
4.	Guide	- - - -	18.37
5.	Present Set Alright	-	14.03

TABLE-XVII

ANIMAL LIKED

1.	Chimpanzee	- - - -	5.77
2.	Monkey	- - - -	11.52
3.	Parrots	- - - -	8.05
4.	White Tiger	- - - -	20.60
5.	Lion	- - - -	18.30
6.	Tiger	- - - -	17.95
7.	Deer	- - - -	2.37
8.	Rhinoceros	- - - -	6.95
9.	Zebra	- - - -	3.37
10.	White Peacock	- - - -	2.25
11.	Bear	- - - -	1.12
12.	Leopard	- - - -	1.70
13.	Elephant	- - - -	2.15
14.	Jaguar	- - - -	1.07
15.	Ostrich	- - - -	1.12

TABLE-XVIII

EXHIBIT LIKED

1.	Safari - - - -	25.15
2.	Moats/Ponds - - - -	19.45
3.	Plains - - - -	19.42
4.	Crocodile Complex - -	20.72
5.	Cages - - - -	26.32

TABLE-XIX

FAVOURITE TREE

1.	Mango - - - -	13.55
2.	Neem - - - -	10.12
3.	Jamun - - - -	13.40
4.	Peepal - - - -	10.12
5.	Ashoka Tree - - - -	15.62
6.	Bamboos - - - -	13.42
7.	Rose - - - -	13.45
8.	Palm - - - -	11.30

Data compiled by :

Mr. M. Kamal Naidu, Director, National Zoological Park,

&

Mr. A.K. Malhotra, Biological Asstt., National Zoological Park.

REFERENCES

Doherty, James G.; 1988A, COMMENTS ON THE DRAFT MASTER PLAN OF THE NATIONAL ZOOLOGICAL PARK, January 23, 1988

Doherty, James G.; 1988B, COMMENTS AND SUGGESTIONS ON THE DRAFT MASTER PLAN OF NATIONAL ZOOLOGICAL PARK, 1988

Ellerton, Nick; 1988, COMMENTS ON MASTER PLAN OF NATIONAL ZOOLOGICAL PARK, NEW DELHI AND OBSERVATIONS NOTED DURING 3 DAYS SPENT IN THE ZOOLOGICAL PARK, 1988

Jones, D.M.; 1988, NOTES AND RECCOMMENDATIONS ARISING FROM A VISIT TO DELHI ZOO 23RD AND 25TH JANUARY 1988, February 1988

Joslin, P.; 1988A, PRIMARY RECOMMENDATIONS RESULTING FROM REVIEWING THE MASTER PLAN FOR THE NATIONAL ZOOLOGICAL PARK OF INDIA, January 23, 1988.

Joslin, P,; 1988B, REPORT TO THE MINISTRY OF ENVIRONMENT AND FORESTS BASED ON POINTS RECORDED DURING THE MEETING TO REVIEW THE MASTER PLAN FOR THE NATIONAL ZOOLOGICAL PARK, HELD IN NEW DELHI ON JANUARY 24, 1988, AND CHAIRED BY MR. T.N. SESHAN, SECRETARY, MINISTRY OF ENVIRONMENT AND FORESTS

Joslin, P.; undated, ZOO MASTER PLANNING

Matthai, Duleep; 1986, A MASTER PLAN FOR THE NATIONAL ZOOLOGICAL PARK (NZP) NEW DELHI, December 25, 1986

Oliver, William L.R.; 1988, REQUESTED COMMENTS AND RECOMMENDATIONS ON THE MASTER PLAN AND THE FUTURE REDEVELOPMENT OF THE NATIONAL ZOOLOGICAL PARK, NEW DELHI, January 8, 1988

Note: Note by Nick Ellerton was submitted to the WWF-India, and kindly made available to the group.

P.Joslin's ZOO MASTER PLANNING is a chapter from a book. The chapter was zeroxed and made available to the group.

The remaining notes were submitted to the Ministry of Environment and Forests, Government of India, as part of the NZP master planning process.

DECISION MAKING FLOW CHART FOR CAPTIVE BREEDING PROGRAMMES FOR WILDLIFE IN INDIA

