Designing Enclosures & Landscape Planning for Indian Zoos

Proceedings of the Workshop of the Zoo Directors
November 2 to 5, 2011
Hyderabad

Central Zoo Authority
New Delhi

Nehru Zoological Park
Hyderabad

Designing Enclosures and Landscape Planning in Indian Zoos
Proceedings of the Workshop of Zoo Directors

The organizers would like to thank all the participants in making this publication a rich source of information.

Disclaimer
The views expressed in this publication do not necessarily represent those of the organizers.

We regret errors or omissions, if any that we may have unintentionally made.

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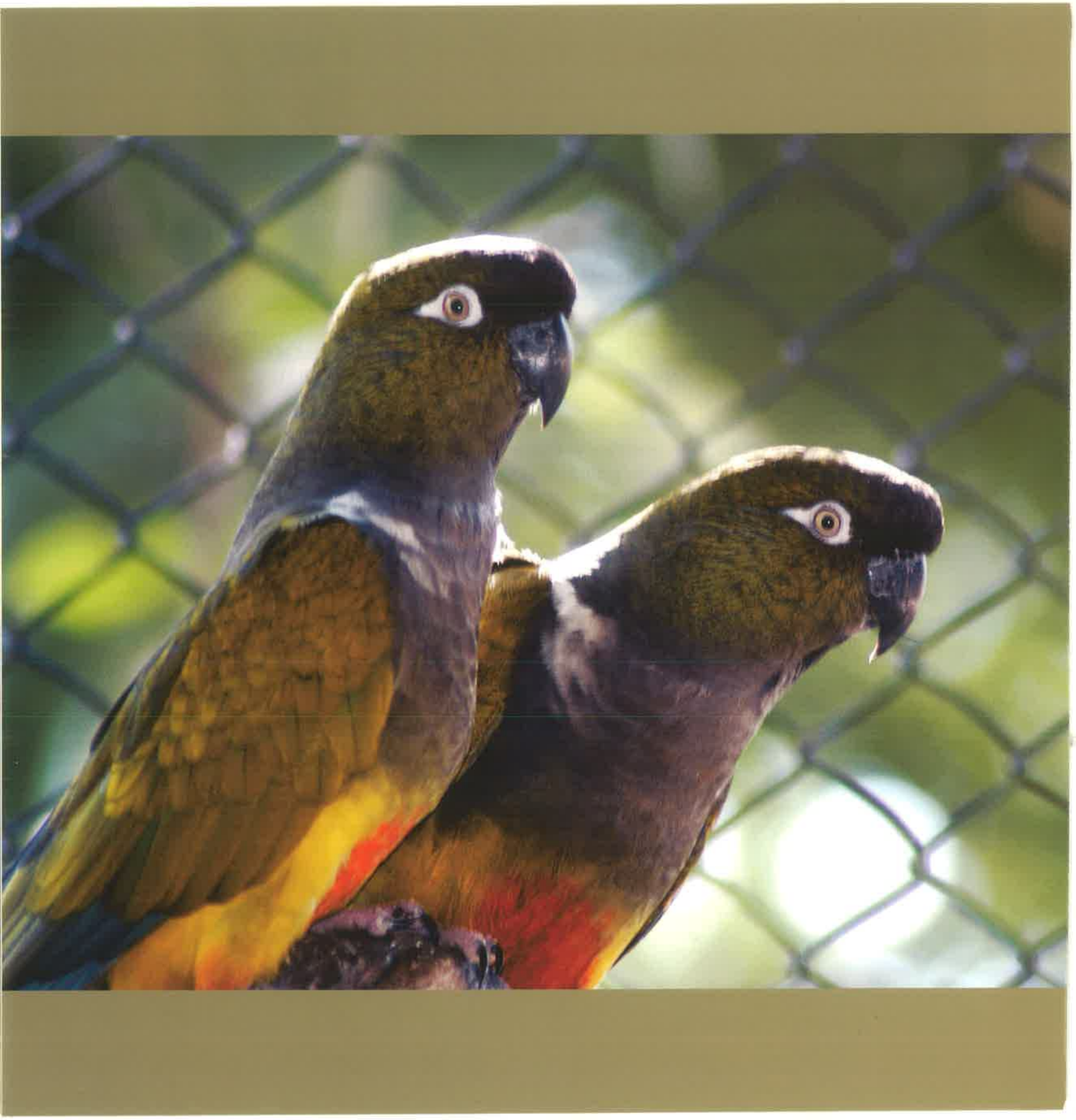
Foreword

The workshop was organized for Zoo Directors, Zoo Managers and Architects, at Hyderabad during 2 and 5 November, 2011 on **Designing Enclosures & Landscape Planning in Indian Zoos** by the Central Zoo Authority in collaboration with Nehru Zoological Park, Hyderabad and Forest Department of Andra Pradesh, in pursuance of the National Zoo policy, 1998 and Recognition of Zoo Rules, 2009 (amended in 2013).

It was envisaged that there is a scope to upgrade the skill and knowledge bank of the zoo managers with the current information available globallly, with respect to the development of zoos, master planning, designing immersion animal exhibits, landscaping of zoos, environmental enrichment. This was considered possible by way of inviting experts from abroad and from India.

I wish that the outcome of the workshop compiled herewith shall be useful to zoo directors, curators, managers & zoo designers for effective management of zoos and the exhibits, as well as landscaping of Zoos. This sure will update their knowledge in the field, and overall performance of their Zoos will be improved.

B S Bonal, IFS
Member Secretary
Central Zoo Authority
New Delhi



Background

Indian Zoos are showing consistent progress and development; thanks to the Central Zoo Authority (CZA) in New Delhi. The appropriate and timely guidance offered by CZA, has helped most Zoos in India.

The Zoo Directors' Workshop is an initiative of Central Zoo Authority, that is being held every two years at different locations in India. Each workshop has a different theme and topic and there are experts invited to give lectures, from within India and abroad. It involves sharing of information and exposure to the best practices used in our country and abroad.

This year's theme has been 'Designing Enclosures and landscape planning'. As everyone expressed, the place - Hyderabad - due to the Nehru Zoological Park, seems a fitting option. This Zoo has done a pioneering work in offering natural surroundings to the wild animals - right from its inception - by constructing open moated enclosures, the designs of which have been well appreciated by all.

We were very happy to conduct this workshop for the Central Zoo Authority, and hope all have been benefitted by exchanging and learning ideas and knowledge.

We are delighted to present the proceedings of this workshop to all participants and others, and we sincerely hope, that the publication is of use to all.

P Mallikharjuna Rao, IFS
Director of Zoological Parks &
Member Secretary, Zoo Authority of AP
November 2 to 5, 2011

Workshop venue - The Green park Hotel, Hyderabad

Technical Session in progress

Zoo Directors and participants at Nehru Zoological Park

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Director Of Zoological Parks & Member Secretary, Zoo Authority of AP

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Principal Chief Conservator of Forests (Wildlife) & Chief Wildlife Warden

-Address by Mr Madhukar Raj, IFS
Principal Chief Conservator of Forests (Head of Forest Force)

-Address by Mr BS Bonal, IFS
Member Secretary, CZA

-Address by the Chief Guest, Sri Satrucharla Vijaya Rama Raju
Minister for Environment, Forest Science & Technology, Govt. of AP

-Vote of Thanks by Mr. Mohammed Abdul Waheed, IFS
Curator, Nehru Zoological Park, Hyderabad

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-Dr Brij Kishor Gupta, Evaluation and Monitoring Officer, CZA, New Delhi
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Mr KSSVP Reddy, IFS, Director, Arignar Anna Zoological Park, Vandalur
Mr Amitab Agnihotri, IFS, Director, National Zoological Park, Delhi
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-**Mr SC Sharma, IFS,** Former Addl. DGF (WL) & MS, CZA, NDelhi - *Random thoughts on master planning*
-**Mr RS Bhadauria, IFS,** Former PCCF (UP) - *Guidance for master planning of zoos*
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-**Mr SK Patnaik, IFS,** Former CWLW & Former Director Nandakanan Zoo, Odissa
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Inaugural Session

The Workshop of the Zoo Directors was inaugurated by Mr Satrucharla Vijaya Rama Raju, the Minister of Forests, Andhra Pradesh, on the 2nd November, 2011, in the venue of Green Park Hotel, Hyderabad, by lighting a lamp.

Welcome Address by P. Mallikharjuna Rao, IFS

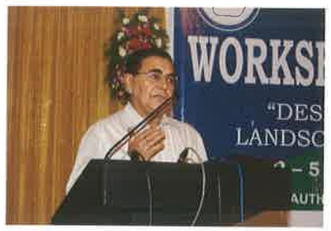
Addl Prl CCF/Director of Zoological Parks/Member Secretary, Zoo Authority of AP

The Director of Zoological Parks, AP welcomed the gathering comprising of the participants, resource persons and guests, to the workshop. He thanked the Hon'ble Minister for Environment, Forest and Science and Technology, AP for coming all the way from a remote village, where he was touring, specially to inaugurate this workshop. He thanked the Central Zoo Authority for giving opportunity to conduct this workshop in Hyderabad that houses the Nehru Zoological Park, which is known for its pioneering contribution in construction of naturalistic enclosures in the country. He mentioned that the workshop would facilitate meaningful discussions, sharing of information and exchange of the best practices pertaining to designing of enclosures and landscape planning and management of the Zoological Parks.

He concluded by wishing all the participants and resource persons a pleasant and wonderful stay in Hyderabad.

Address by Sri Hitesh Malhotra, IFS

PCCF (Wildlife) & Chief Wildlife Warden



The Chief wildlife Warden said in his address that Andhra Pradesh State has a network of 21 Wildlife Sanctuaries, 6 National Parks that covers about 13,000 sqkms, which is closer to 5% of the geographical area of AP.

The state has the largest fresh water lake in the country 'Koleru' which is home for various migratory and resident birds. The State also has second largest brackish water ecosystem of the Country -Pulikat lake-which supports largest congregation of Flamingo birds.

AP Forest Department is actively involved in conservation of sea turtles, restoration of mangroves, rescue of wild animals in human-animal conflict situation. All the 3 Zoological Parks are doing good work in Conservation Breeding of animals, Environmental Education of visitors, Animal rescue and many other activities.
He welcomed the participants and requested the Central Zoo Authority to co-operate in development of the Zoos in AP by way of technical and financial support in the activities taken up in Zoo management including animal exchange programme.

Address by Sri C Madhukar Raj, IFS

Principle Chief Conservator of Forests (Head of Forest Force)

The PCCF stated in his address that he was extremely happy about the Zoo Directors' Workshop was taking place in Hyderabad. He said that the state of Andhra Pradesh has a forest area of 63,814 sqkms which is endowed with rich flora that harbours diverse species of animals. The state has unique features like a long sea coast that has undulating topography of Eastern Ghats, the estuaries of river Godavari and Krishna having extensive mangrove forests, and climate that is comfortable for wildlife, with no extreme temperatures, except for two months of Summer heat.
AP Forest Department is maintaining 3 zoological parks at Hyderabad, Tirupati and Visakhapatnam, with a view to promote ex-situ conservation of wildlife.
He welcomed all participants and experts to see not only the Nehru Zoological Park but also different activities of the Forest Department in Andhra Pradesh.

Address by Sri BS Bonal, IFS

Member Secretary, Central Zoo Authority, New Delhi

Mr Bonal expressed his happiness that the Workshop could be conducted successfully despite the Law and Order problems in the state, due to Telangana movement and agitations which were at its peak.

He was very happy about the arrangements made for the participants by the Zoo Authorities at Hyderabad, and workshop being organized well.
He felt the Topic of Designing Enclosures and landscape planning was very relevant and need of time. He felt the location of the workshop in Hyderabad was rather an appropriate place as Nehru Zoological Park, right from its inception has taken a stand of providing natural surroundings to the animals in the Zoo and had large and open moated enclosures. He pointed out that the periodic workshop conducted like this, always has helped in exchange of ideas and resulting in improvements in the Zoos.

Address by Sri Satrucharla Vijaya Rama Raju

Minister for Environment, Forests, Science and Technology, Govt. of A.P.

Dignitaries on the dais, Expert resource persons from India and abroad, Directors from important Zoos of the Country, Senior Forest Officers, friends from media and other distinguished guests. I am indeed very happy to meet the Zoo Directors on this occasion. I am glad to inform that in our state the 3 important Zoo parks at Hyderabad, Vishakhapatnam and Tirupati are functioning well and contributing to wildlife conservation, nature education, animal research, conservation breeding, rescue and rehabilitation of wild animals. The Nehru Zoological Park at Hyderabad is considered as one of the best and pioneering Zoos in the country with several firsts to its credit such as Lion Safari Park (1974), Nocturnal animal house (1982), Open butterfly Park (1998), Pre- historic park, Reptile house etc. At Tirupati, we have the largest Zoo in the country with an earmarked area of 2212 Ha and with an unique theme of animals display based on Indian Mythology. The Zoo at Visakhapatnam is situated amidst the vast expanse of Eastern Ghats with Bay of Bengal as eastern boundary. Having more than 3 million visitors, the Zoos in the state are spreading the message of wildlife conservation widely. Our Zoos are acting as good conservation breeding centers for pure Asiatic Lions, Tigers, Mouse deer, Jungle Fowl, Wild dogs (Dhole) and various other animals. I am happy to inform that the Zoo Authority of Andhra Pradesh (ZAAP), an autonomous society has been constituted for better management of the Zoos and our State Government has permitted to plough back revenue earned by Zoos for their maintenance and development. I express my sincere appreciation for the Central Zoo Authority in conducting this workshop with a theme of "Designing and landscape planning for the Zoo Parks" which is most required in today's time and it carries great application value for development of the Zoos in the country. Animal enclosures should be designed in such a way that the animals live happily as they are in the wild and express their natural behavior without any hindrance. Zoo visitors should get a unique experience of seeing the animal and learn properly about the animal habitat, outstanding features of animal and experience ecology of the surroundings. Animal Keepers should also feel comfortable in discharging their functions relating to animal husbandry, nutrition and veterinary care.

Reputed national and international experts in the field of Zoo management are here in the workshop for facilitating the information and dissemination on modern technologies and the best practices available in India and abroad. I hope, there will be meaningful deliberations and effective sharing of experiences in the workshop and lead to overall improvement in the management of Zoos in the Country. **Thank you all.**

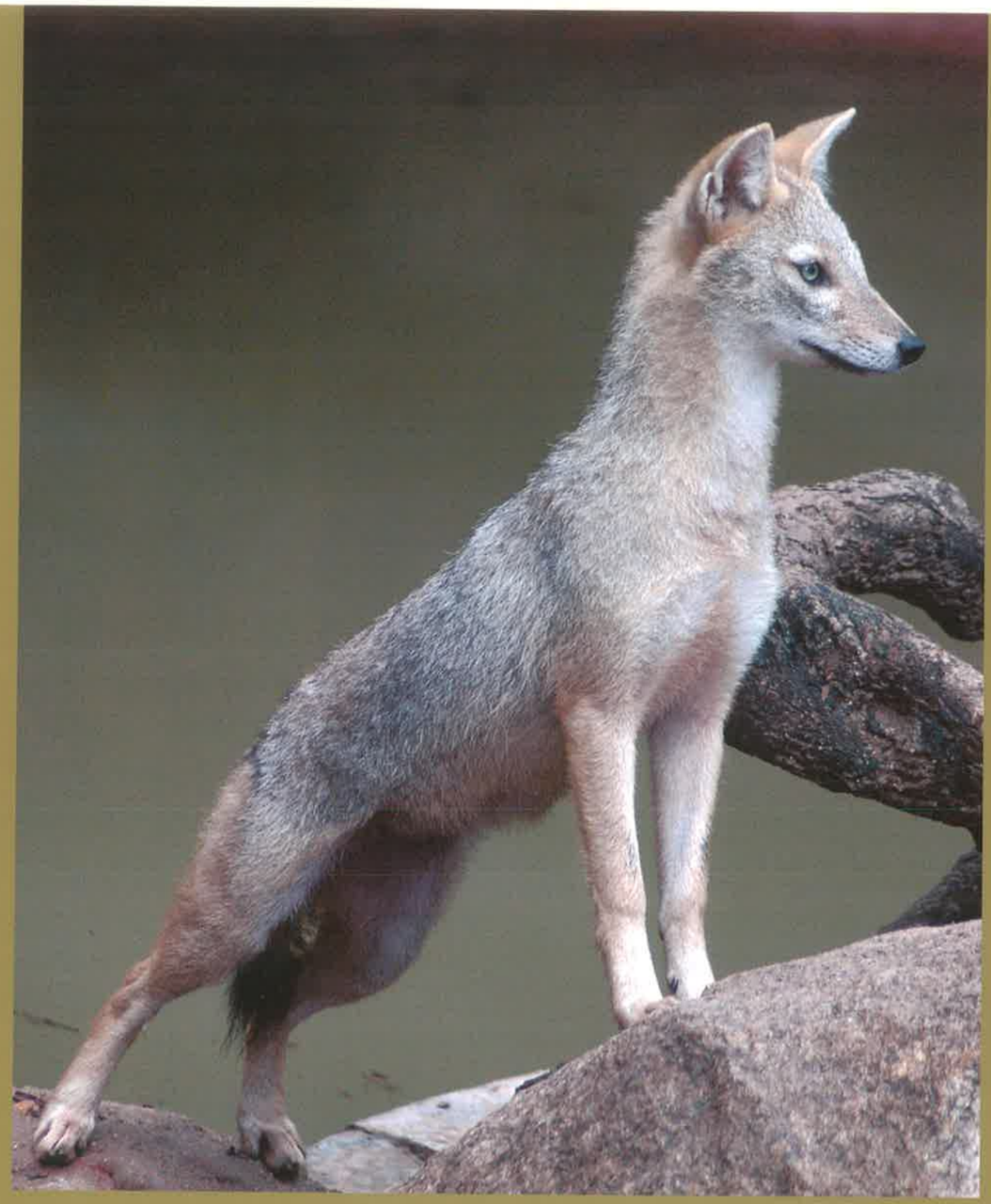
Vote of Thanks by Mr. Mohammed Abdul Waheed IFS

Curator, Nehru Zoological Park, Hyderabad

Mr Waheed, the Curator of the Nehru Zoological Park offed the vote of thanks at the end of the Inaugural Session. He thanked profusely the CZA, for giving an opportunity to conduct the workshop in Hyderabad. He then thanked all the participants i.e, the Zoo directors, the resource people from India and abroad, the guests and the staff of APFD and NZP. He thanked the Hon'ble Minister for inaugurating the workshop and gracing the occasion.

Hon'ble Minister speaks

Participants and Guests at the Inaugural session



Technical Session 1

Importance of the workshop on Landscape planning and Zoo Designing
Speaker: Mr BS Bonal, IFS, Member Secretary, CZA

Presentation of Mr BS Bonal, IFS, Member Secretary, CZA, gave an idea regarding creation of expertise on Zoo architecture and landscape designing and explained about Recognition of Zoo rules for development & planning, animal housing, display of animals and animal enclosures, guide lines have to be formed by experience sharing, guidelines for minimum paddock area, innovative exhibit design and barriers, for scientific management and to develop guidelines on landscape planning and exhibits. He said, "we experience that there are some difficulties faced while designing. Designing has to be site specific and species specific and every group will give their inputs. Strong guidelines are expected for creating the design."

Landscape Planning and Zoo Designing

- by BS Bonal, IFS

"Landscape Planning and Zoo Designing"

B. S. Bonal
Member Secretary
Central Zoo Authority

National Zoo Policy, 1998

Research And Training

3.6.1

"The zoos shall encourage research on the biology, behaviour, nutrition and veterinary aspects of animals in their collection.

They shall also endeavor for **creation of expertise on zoo architecture and landscape designing**, cooperation of recognised institutions already working in relevant fields in this regard shall be taken".

Recognition of Zoo Rules, 2009 (Rule 10{3})

Dated 11.11.2009

- **Development and Planning**

(1) Every zoo shall prepare and get the master plan approved by the Central Zoo Authority

(2) Zoos that are in operation at the time of the commencement of these rules, shall prepare and get the master plans approved from the Central Zoo Authority within one year of the date of commencement of these rules.

(3) The master plan referred to in sub-paragraphs (1) & (2), shall inter alia, include all round development of the zoo for a period of twenty years which shall be revised every ten years along with a detailed layout plan prepared on the basis of the theme adopted by the zoo, indicating the locations of green belts, lawns, gardens, animal display area, visitor facilities, support infrastructure for animal upkeep and healthcare, buildings for administrative and maintenance unit.

Recognition of Zoo Rules, 2009 (Rule 10{3})

Dated 11.11.2009

(4) Atleast 30% of the area earmarked for the zoo shall be kept under green belt and natural vegetation and the area for animal housing shall not exceed 30% area of the zoo..

(5) Every zoo shall take adequate care to locate and design all *'pucca'* buildings including the visitor facilities in such a manner that the natural landscape of the zoo and animal enclosures are not masked and the cleanliness and hygiene of the zoo is not affected.

(6) No zoo shall accept any rescued animal unless it has appropriately designed enclosure and upkeep facilities for the animal as well as the facilities for keeping it in isolation during quarantine period.

Expectation?

To develop guidelines on landscape planning and exhibit designing.

Expectation?

<u>Zoo Directors to have an in-depth knowledge on the following</u>:

- Landscape Planning – site specific/species specific
- Landscape Habitat Immersion
- Approach to Zoo Design (Architectural design and landscape architectural design).
- Zoo Designing
- Creating thematic exhibit scenarios
- Providing Design Examples

Expectation? (Contd)

For the planned management of species and meet the species specific requirement, the guidelines prepared during the workshop may include in depth details on enclosure requirement like:

- **Biology**
- **Animal Behaviour**
- **Exhibit Habitat**
- **Exhibit Barrier**
- **Exhibit Paddock**
- **Off-Exhibit Feeding, Retiring Cells & Kraal**
- **Animal Isolation Areas/Breeding Areas**
- **Interpretive**
- **Providing Barrier Design details**
- **Enrichment**

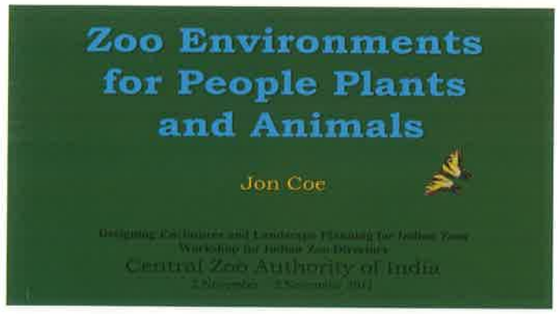
THANK YOU

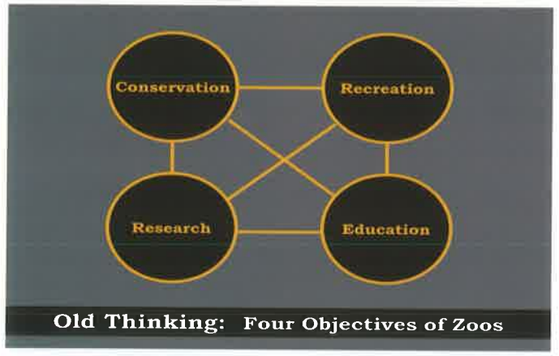
Zoo Environments for People, Plants and Animals
Speaker: Mr. Jon Coe, Australia

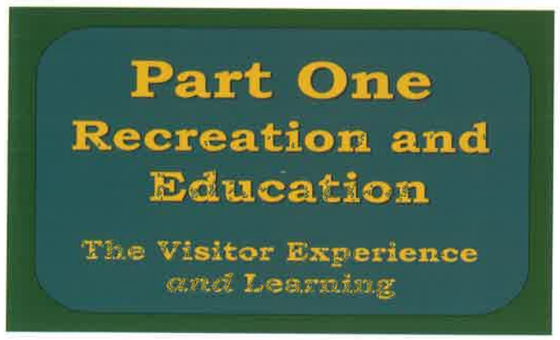
He gave an idea in his presentation "Zoo environments for people, plants and animals" about improving relationship with people, plants and animals. He mainly stressed on six objectives for a successful zoo such as, recreation and education, zoo design philosophies, immersion design techniques, cultural immersion, viewing point of animal and visitor accommodations and also explained objects related to ex-situ conservation, animal competence, and environmental enrichment.

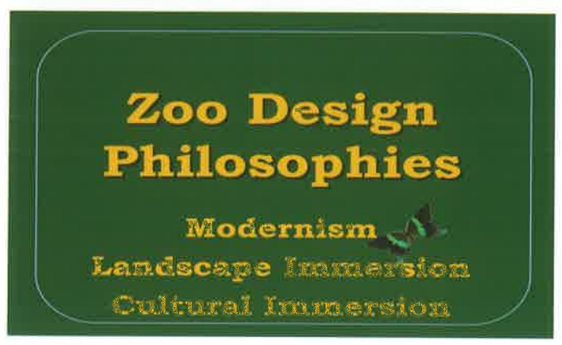
Zoo Environments for People, Plants and Animals

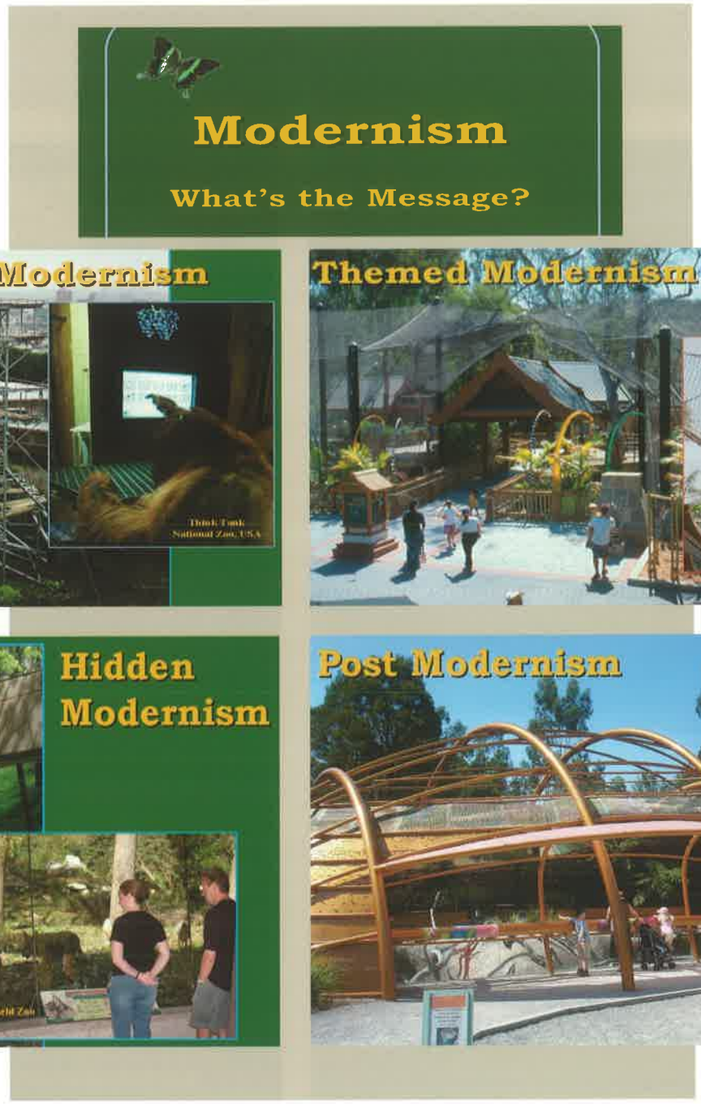
- by Jon Coe



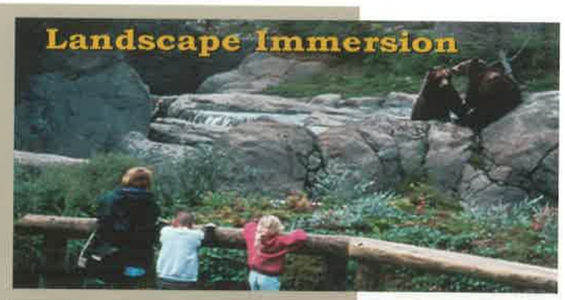


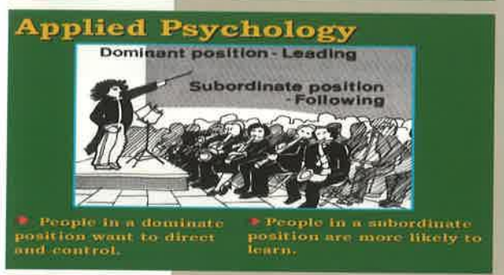


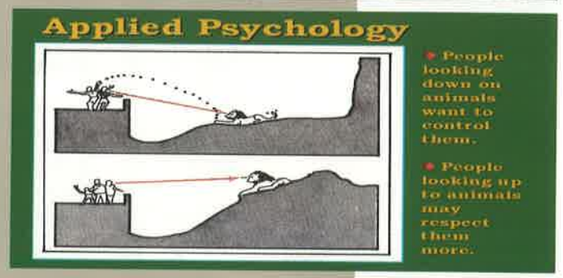


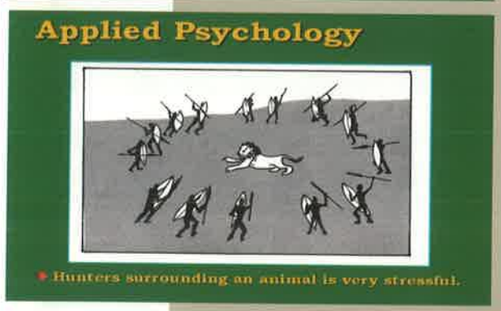

Modernism
What's the Message?
Functional Modernism
Kyoto Primate Institute
Think Tank
National Zoo, USA
Themed Modernism
Los Angeles Zoo
Hidden
Modernism
Brookfield Zoo
Post Modernism
Healesville Sanctuary

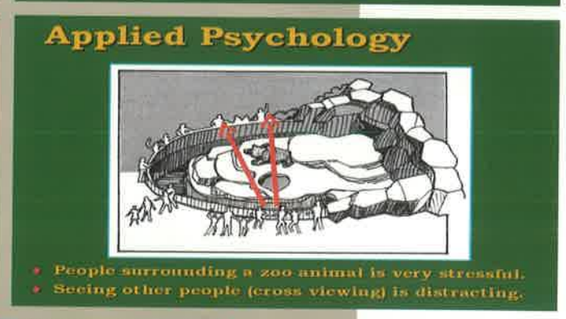

Landscape Immersion
What's the Message?

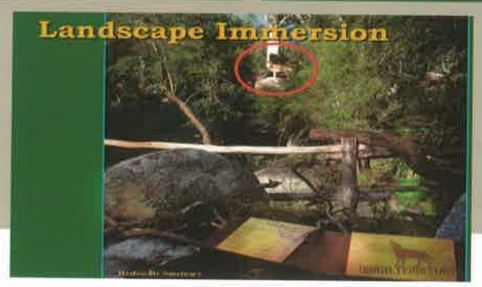

Landscape Immersion

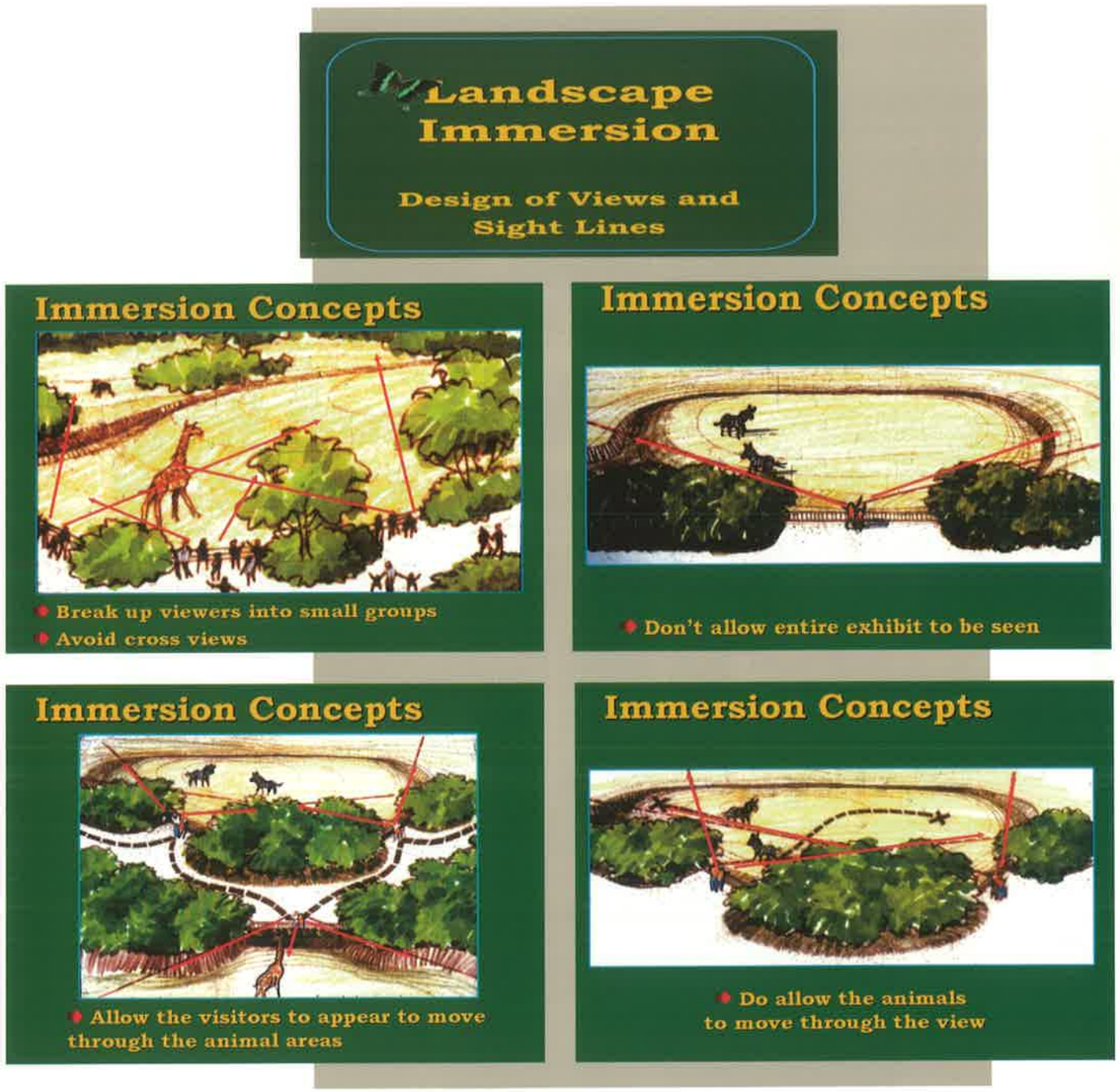

Applied Psychology
Dominant position - Leading
Subordinate position - Following
People in a dominate position want to direct and control.
People in a subordinate position are more likely to learn.

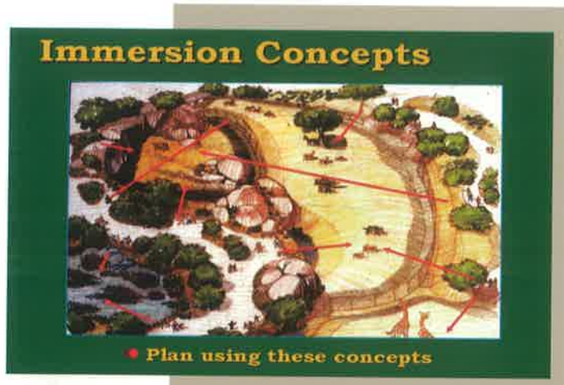

Applied Psychology
People looking down on animals want to control them.
People looking up to animals may respect them more.

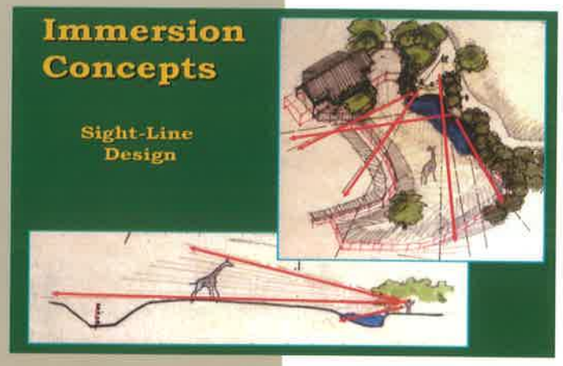

Applied Psychology
Hunters surrounding an animal is very stressful.

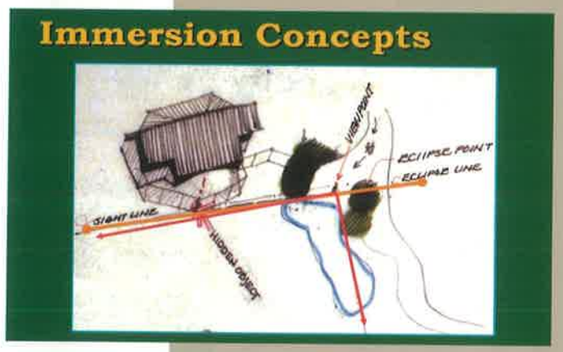

Applied Psychology
People surrounding a zoo animal is very stressful.
Seeing other people (cross viewing) is distracting.

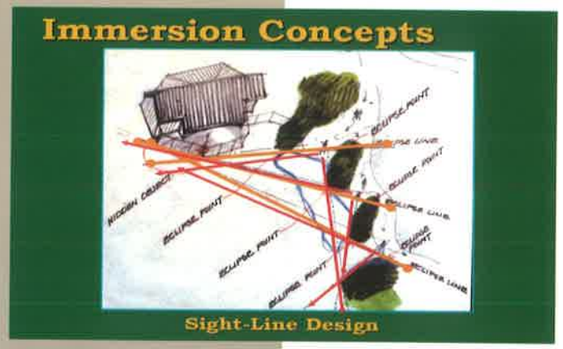

Landscape Immersion

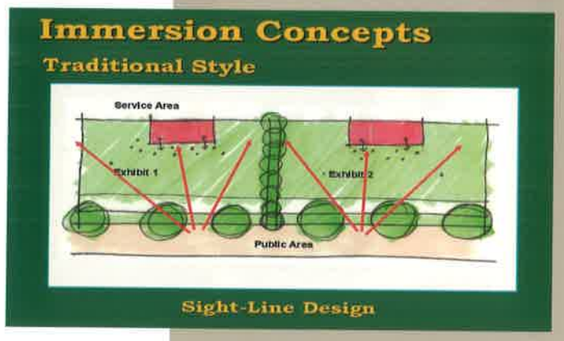

Landscape Immersion
Design of Views and Sight Lines
Immersion Concepts
Break up viewers into small groups
Avoid cross views
Immersion Concepts
Don't allow entire exhibit to be seen
Immersion Concepts
Allow the visitors to appear to move through the animal areas
Immersion Concepts
Do allow the animals to move through the view

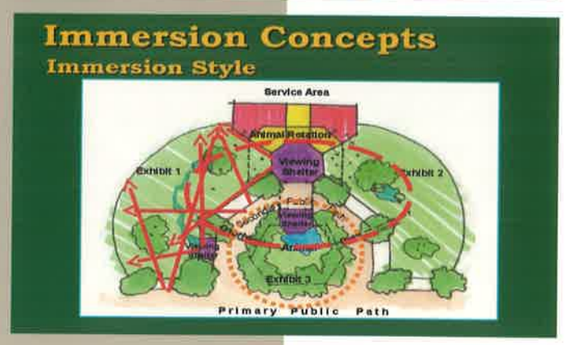

Immersion Concepts
Plan using these concepts


Immersion Concepts
Sight-Line Design


Immersion Concepts
VIEWPOINT
ECLIPSE POINT
ECLIPSE LINE
SIGHT LINE
HIDDEN OBJECT

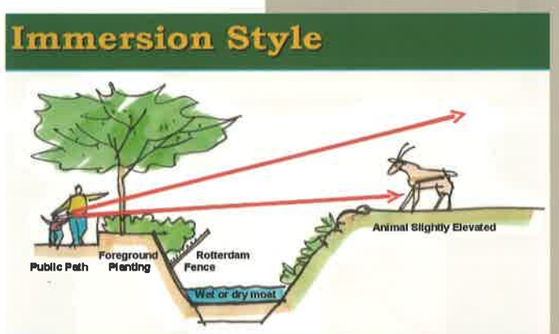

Immersion Concepts
Sight-Line Design


Immersion Concepts
Traditional Style
Service Area
Exhibit 1
Exhibit 2
Public Area
Sight-Line Design

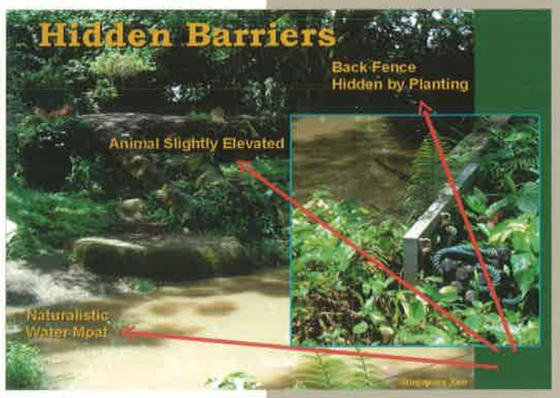

Immersion Concepts
Immersion Style
Service Area
Animal Rotation
Viewing Shelter
Exhibit 1
Exhibit 2
Exhibit 3
Primary Public Path

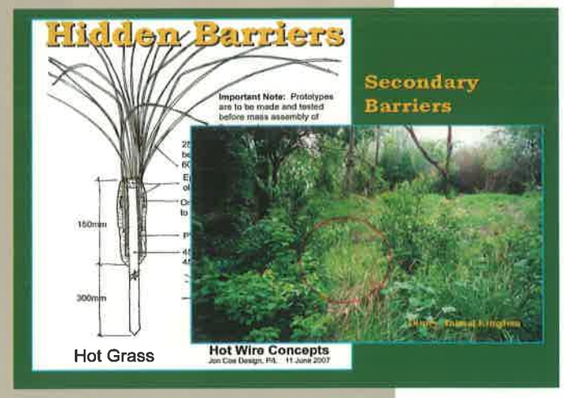

Landscape Immersion
Barriers


Hidden Barriers


Immersion Style
Public Path
Foreground Planting
Rotterdam Fence
Wet or dry moat
Animal Slightly Elevated
Sight-Line Design and Hidden Barriers

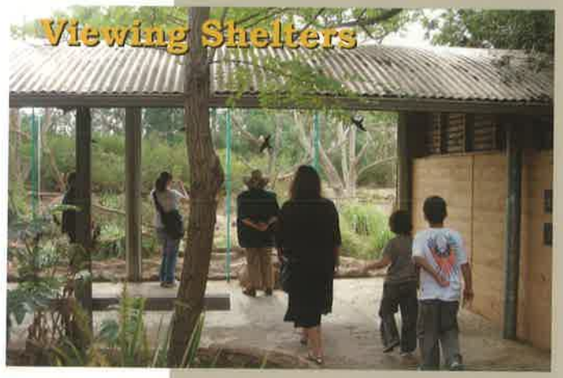

Immersion Style
Foreground planting
Lion
Public Path
Dry Moat
Hot Wire
Planting Hides Fence
Sight-Line Design and Hidden Barriers

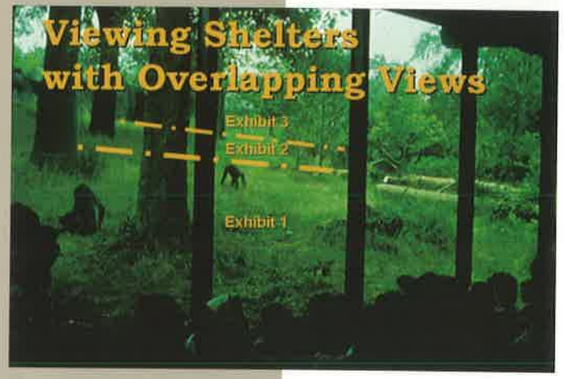

Hidden Barriers
Back Fence Hidden by Planting
Animal Slightly Elevated
Naturalistic Water Moat


Hidden Barriers
Important Note: Prototypes are to be made and tested before mass assembly of
150mm
300mm
Hot Grass
Hot Wire Concepts
Jon Cox Design, P/L 11 June 2007
Secondary Barriers


Hidden Barriers
Interior Vine Detail
Hot Wire Concepts


Landcsape Immersion
Viewing Shelters

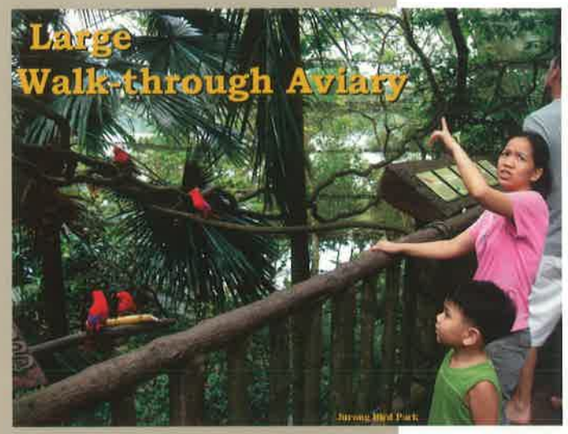

Viewing Shelters

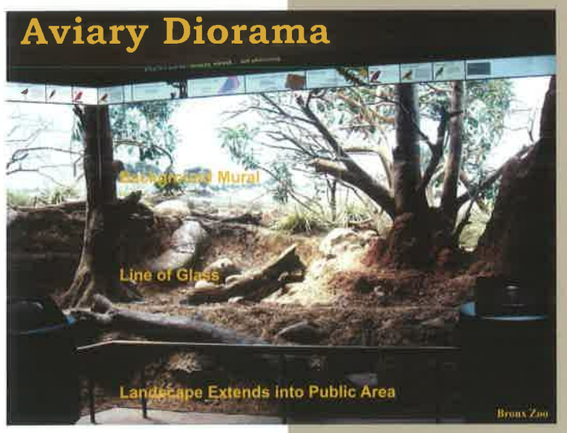

Viewing Shelters with Overlapping Views
Exhibit 3
Exhibit 2
Exhibit 1

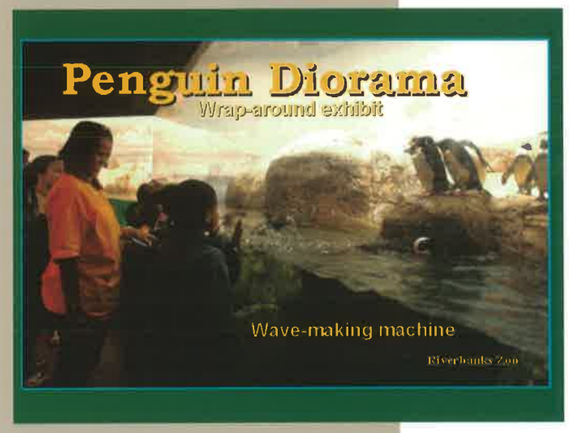

Viewing Shelters and Mini-Museum


Viewing Shelters and Mini-Museum


Gorilla Overpass
Bronx Zoo


Large
Walk-through Aviary


Aviary Diorama
Line of Glass
Landscape Extends into Public Area
Bronx Zoo


Penguin Diorama
Wrap-around exhibit
Wave-making machine
Riverbanks Zoo

IV

Cultural Immersion

Cultural Immersion

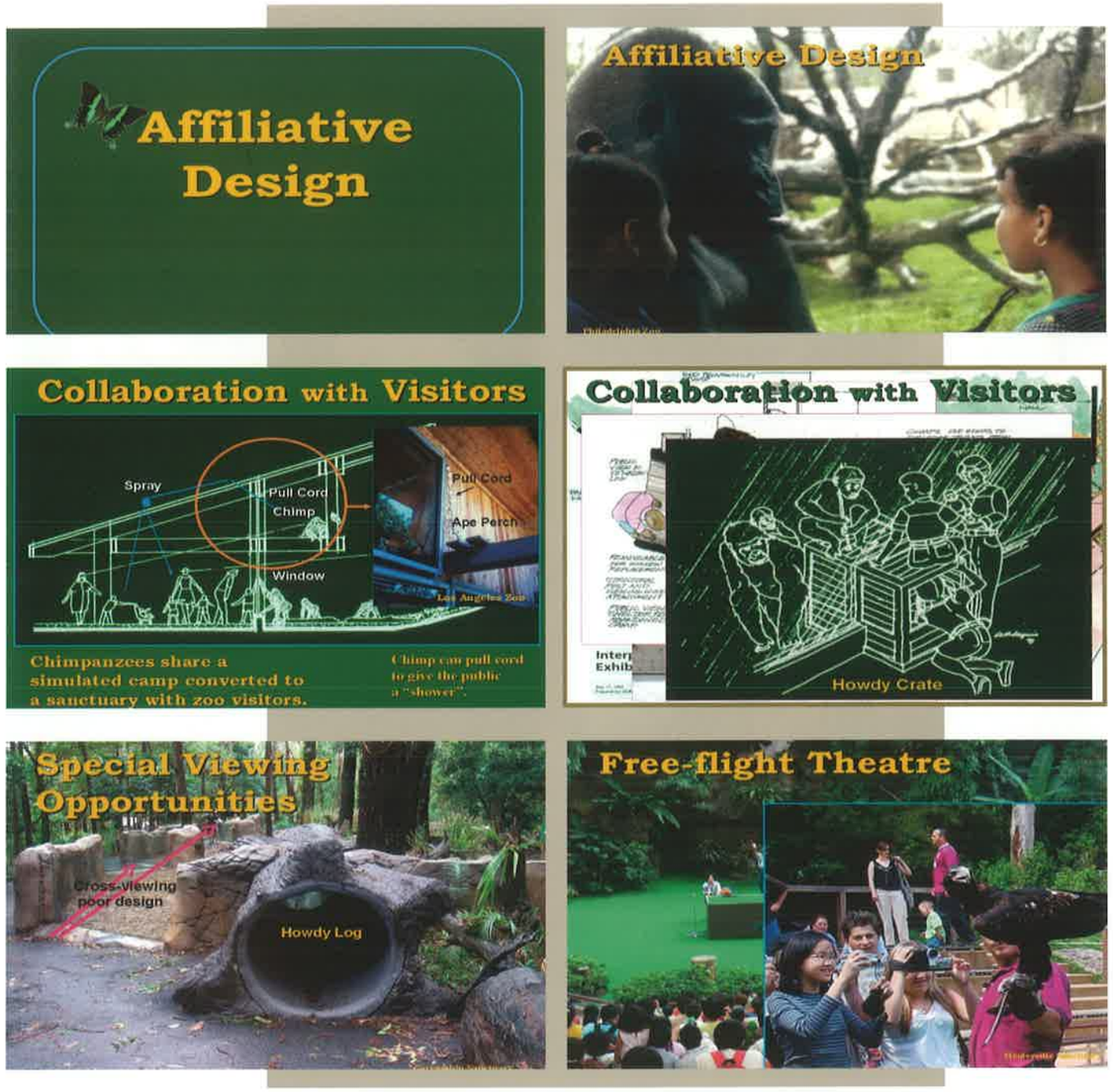
Cultural Immersion

Cultural Immersion

What's the Message?

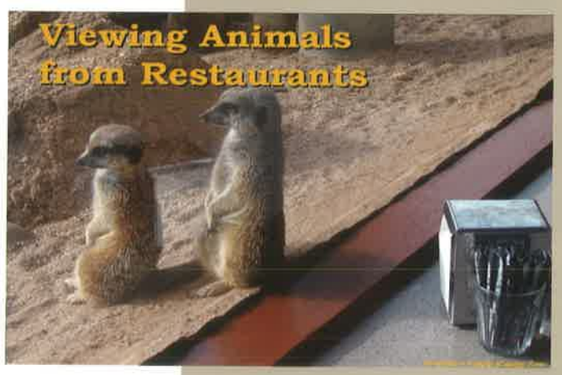
Cultural Immersion:

- Experience of seeing animals in vernacular, cultural setting
- Message of interdependence of animals of people and human domination
- Naturalistic and vernacular enrichment


Affiliative Design
Affiliative Design
Collaboration with Visitors
Spray
Pull Cord
Chimp
Window
Pull Cord
Ape Perch
Chimpanzees share a simulated camp converted to a sanctuary with zoo visitors.
Chimp can pull cord to give the public a "shower".
Collaboration with Visitors
Howdy Crate
Special Viewing Opportunities
Cross-viewing poor design
Howdy Log
Free-flight Theatre


Free-flight Theatre
Jurong Bird Park


Public Feeding Wild Birds
LORIKEET FEEDING
Morning
8.00 - 9.30
Afternoon
4:00 - 5:00
Map ref.

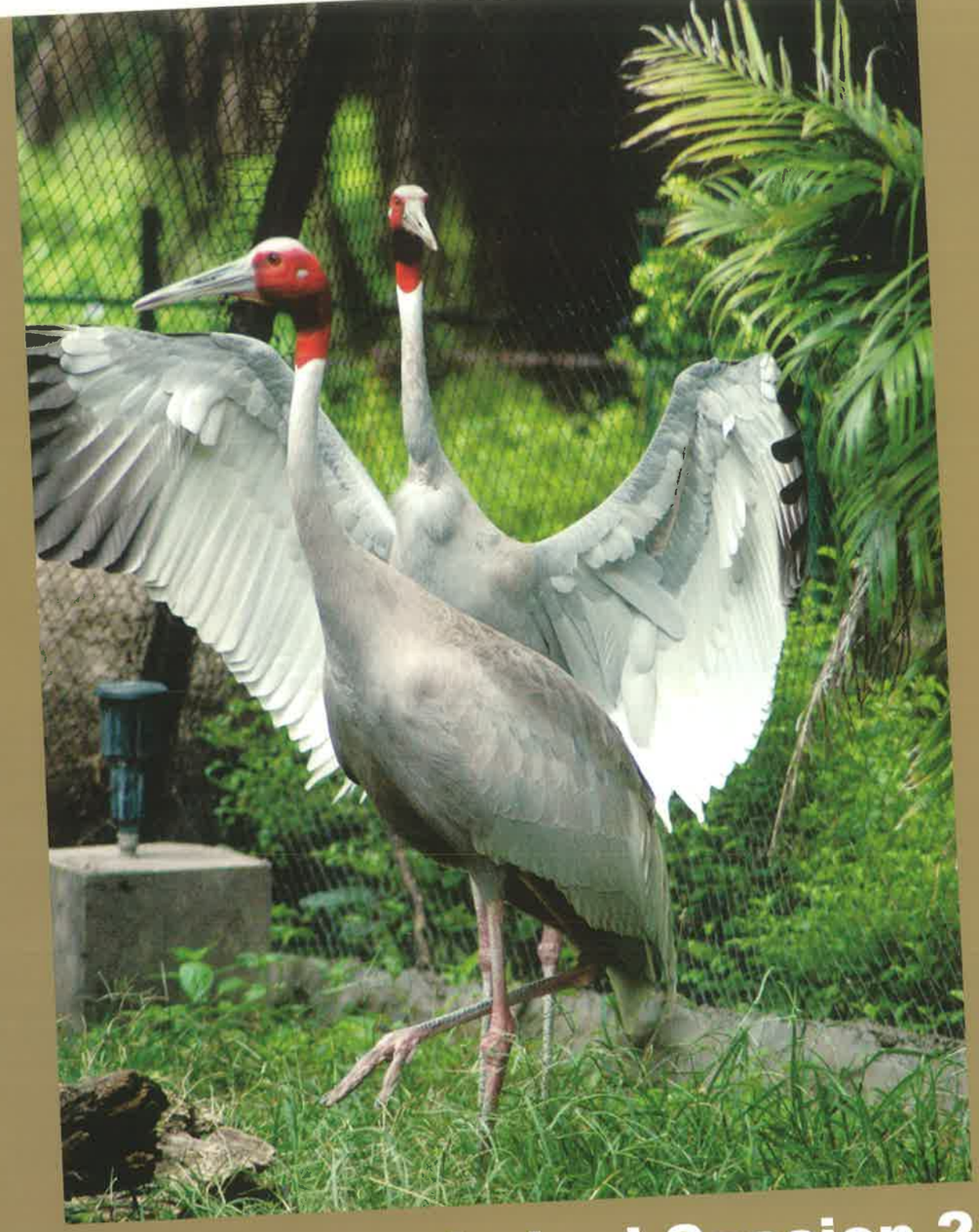

Viewing Animals
from Restaurants


Woodland Park Zoo


Questions?

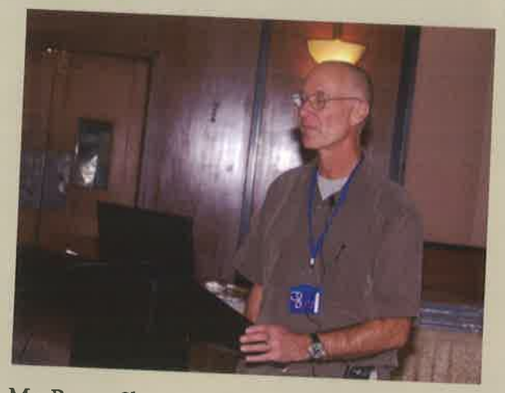
Presentations by BS Bonal

Audience at Technical Session 1



Technical Session 2

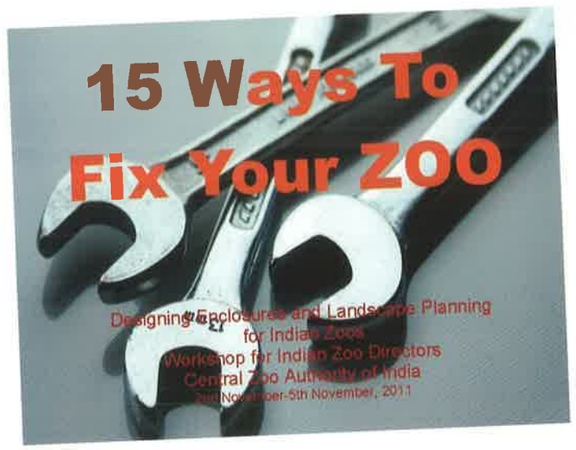
15 Ways to fix your Zoo
Speaker: Mr. Roger Shermon, PJA rchitects, USA

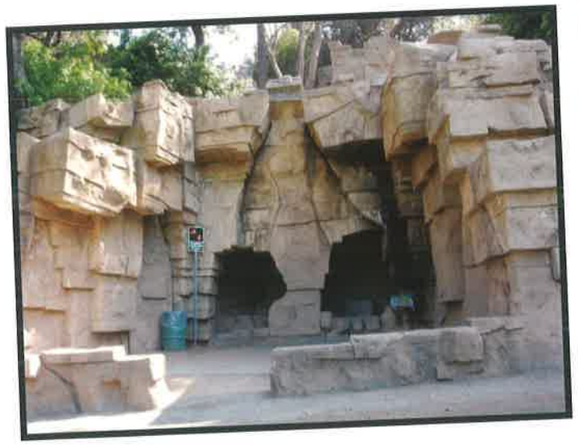


Mr. Roger Shermon focused in his presentation in this workshop that zoos should have a competition with other parks. To bare this competition, every zoo would have to fix 15 ways to success. This is what is being said in his presentation "15 ways to fix your zoo".

15 ways to Fix Your Zoo

- by Roger Shermon





I have 27 years of experience designing zoos....

That's over 51,000 hours of design….

I've worked on over 70 zoo related projects, visited 65 zoos in 22 countries. I've visited rainforests, temperate forests, grasslands and deserts.

The more you learn, the more you realize how little you know…

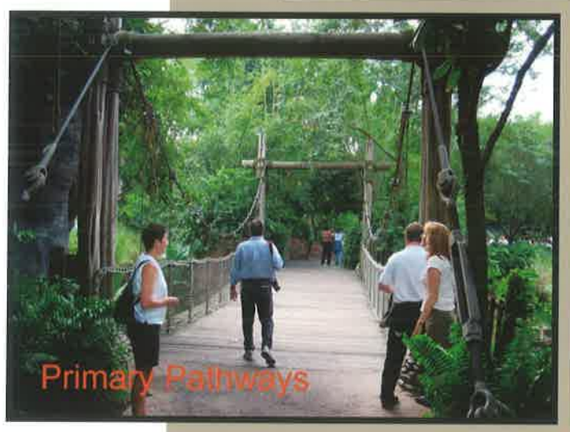
I believe nature above all else is why we go to the zoo. People have a fundamental, psychological and spiritual response to nature.

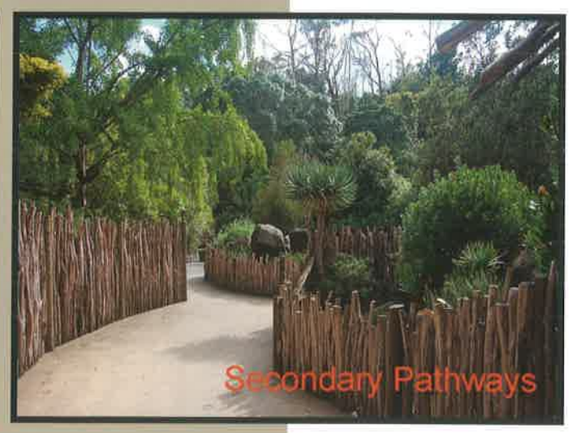
15 Ways to Fix Your Zoo

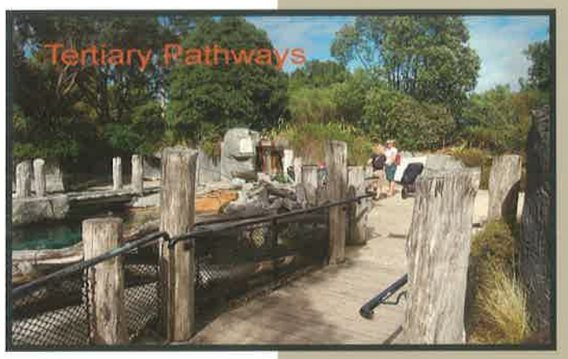
1. Link the zoo to the Community

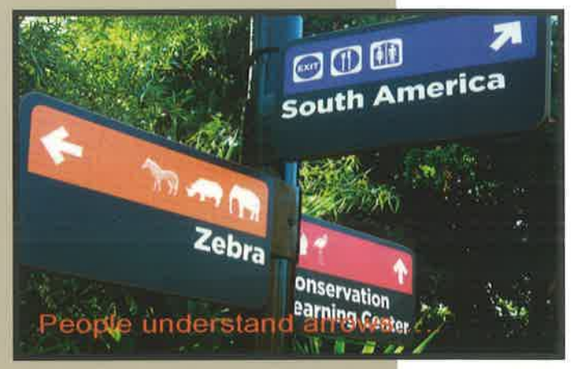
2. Make A Zoo Center

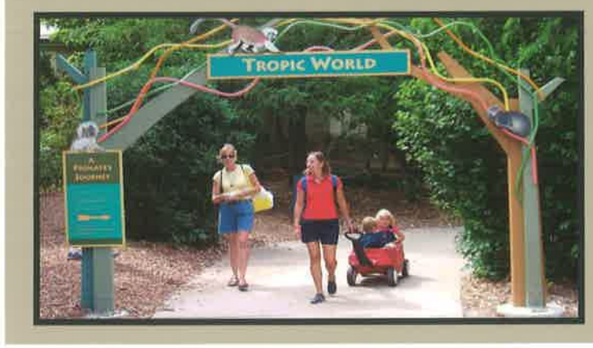
3. Create Hierarchies of Pathways

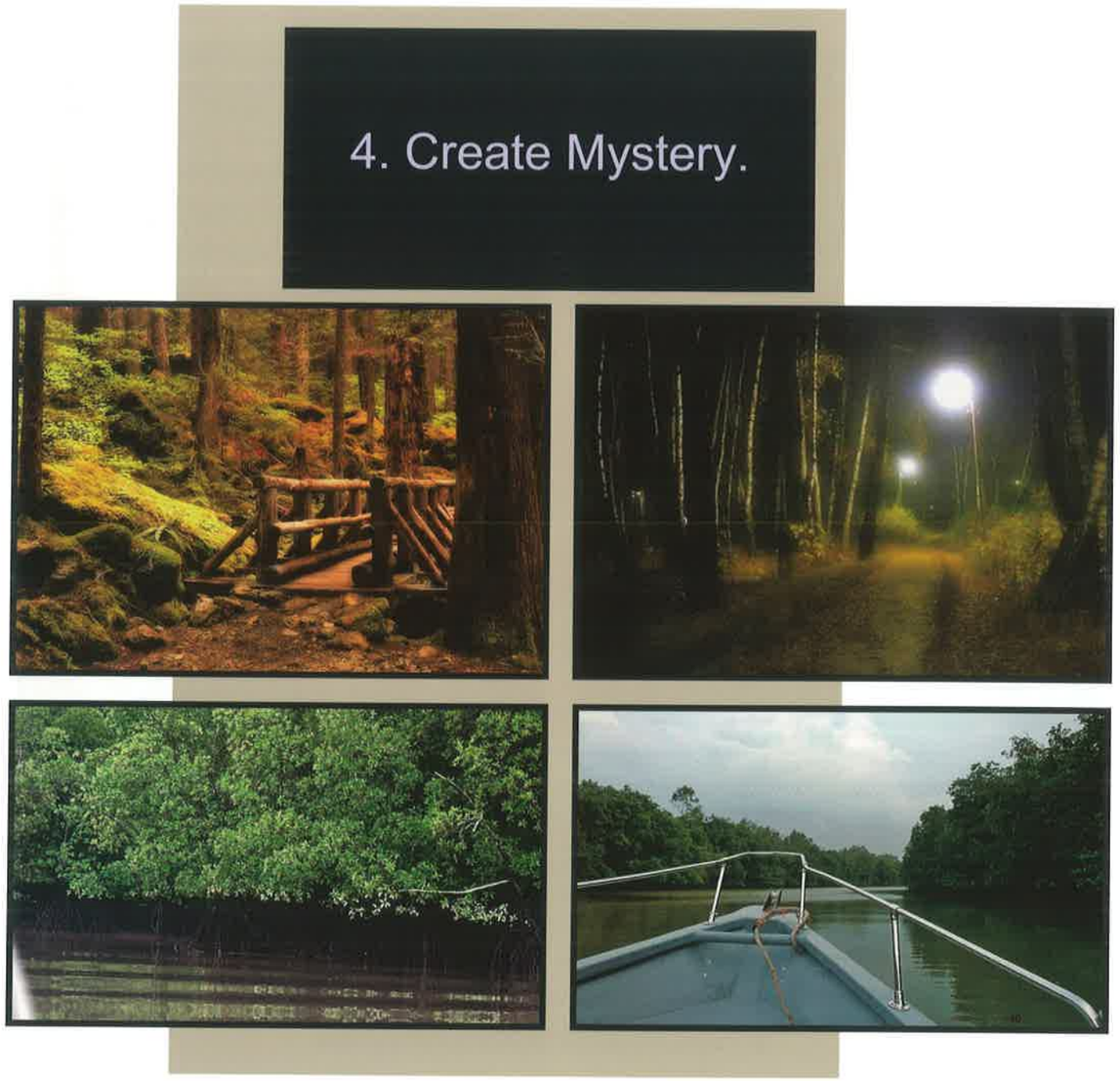





Tertiary Pathways


South America
Zebra
People understand arrows


TROPIC WORLD

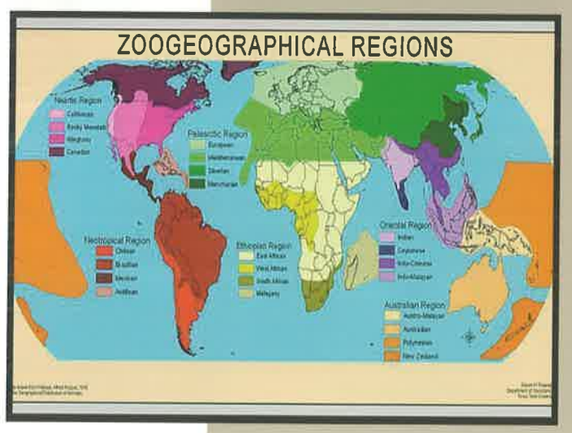

4. Create Mystery.

5.Develop Stories.

For example:
Polar bears spend so much time in water that they are considered a marine mammal.

6. Establish A Theme.

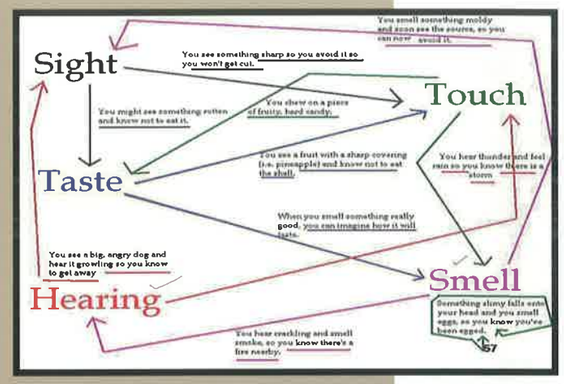
Organizational Themes:
Systematic
Zoogeographic
Bioclimatic



Other ways to theme a zoo:

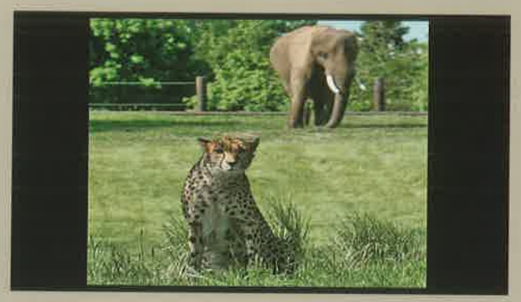
predator/prey relationships
man's interaction with animals
size, evolution, social behavior, adaptations.....

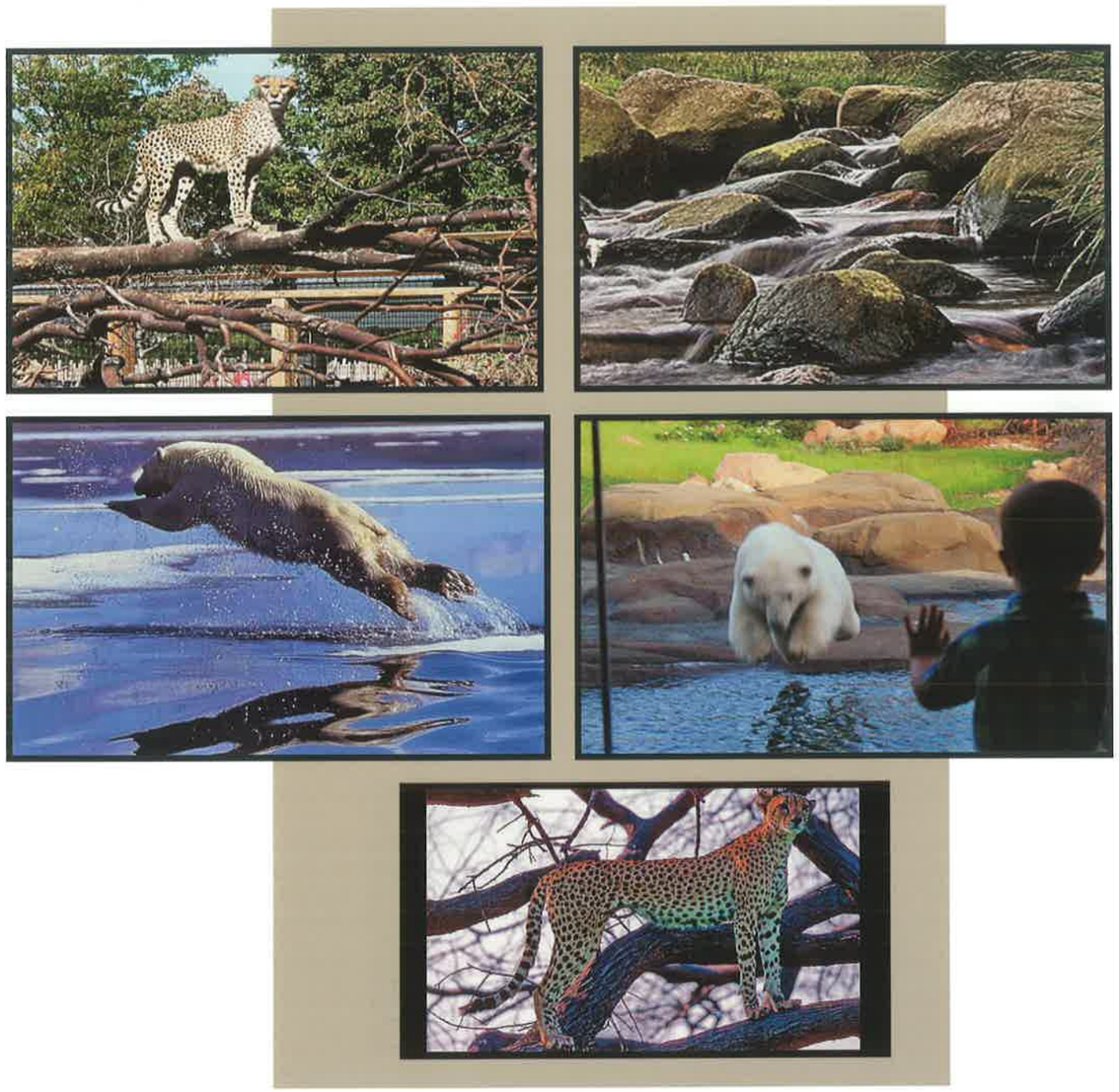
7. Setting Up The View.



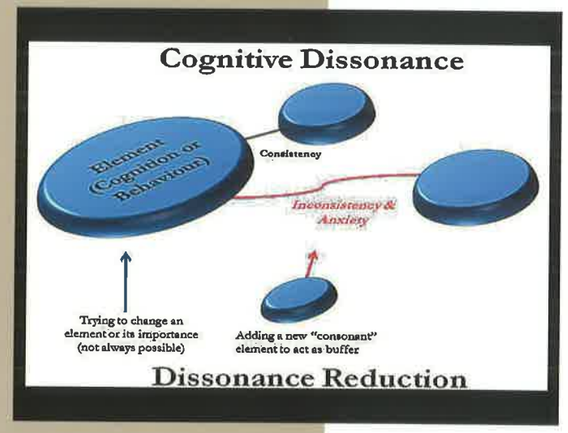
8. Immerse in the Landscape.

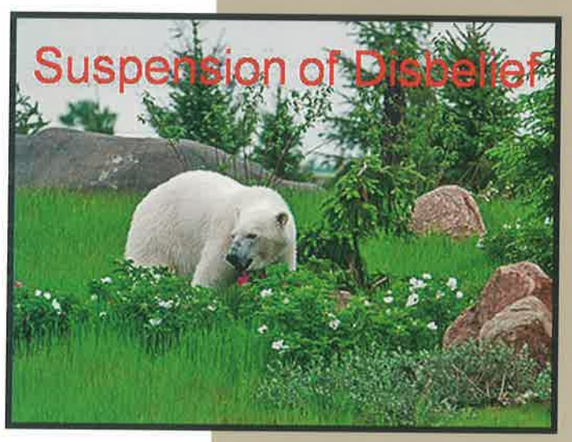
9. Simulate Nature.





10. Reduce Cognitive Dissonance, Suspend Disbelief, Create Visual Logic.



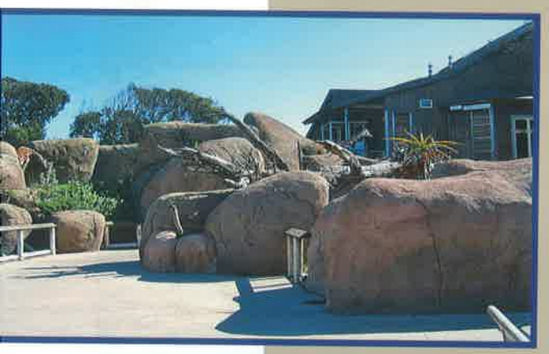


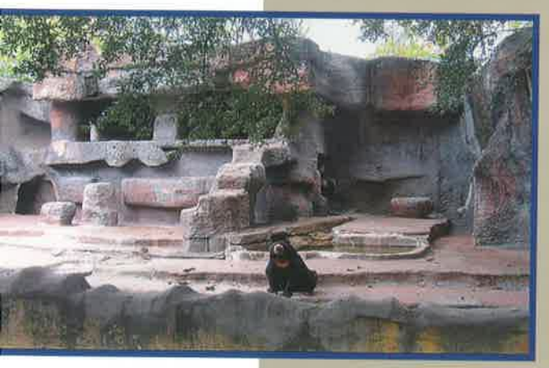
11. Design for Detail.

12. Meet the Needs of the Users.

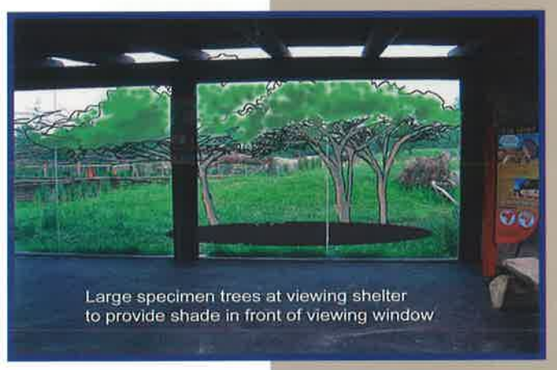
13. Hide Boundaries.

14. Hide Holding Buildings.





15. Create High Standards of Animal Husbandry and Care.




Easy transfer of animals


Easy Door Operation


Animal Hospital


Vet Staff

Q&A

Thank you.

Photographs of Zoos at Tirupati and Visakhapatnam

Workshop audience

Roger Shermon while delivering his talk

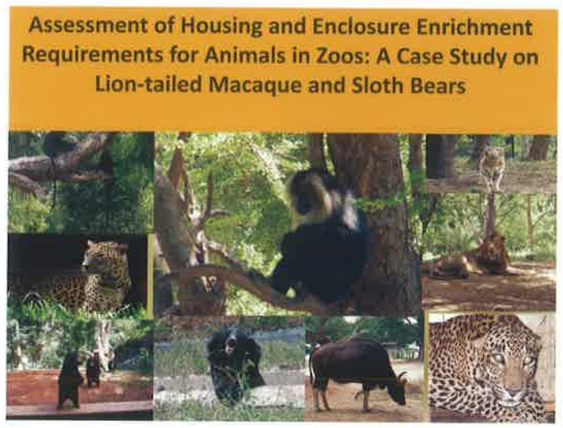
Workshop audience

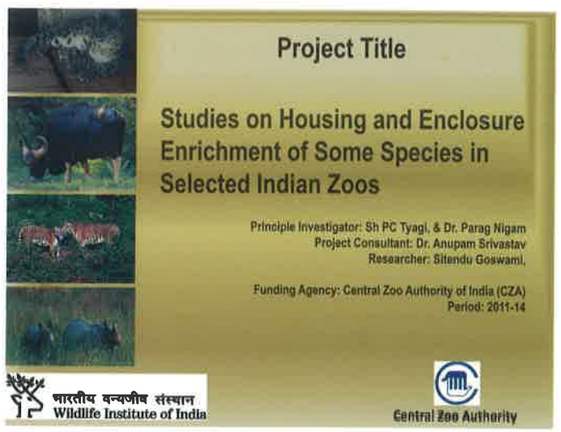
Assessment of Housing and enrichment requirement for animals in the zoos: Case study on Lion tailed macaque
Speaker: Mr. PC Tyagi, Wildlife Institute of India, Dehradun

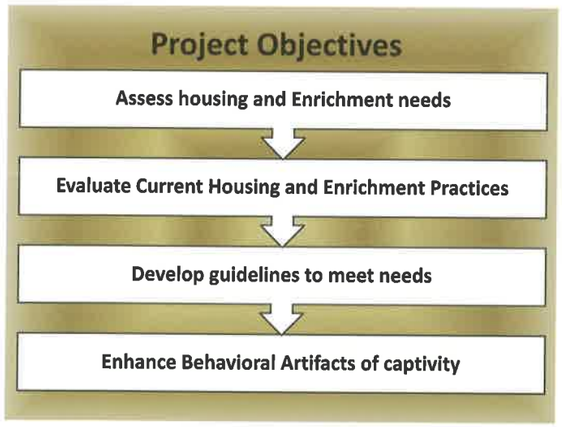
Sri PC Tyagi explained in his presentation "Assessment of Housing and enrichment requirement for animals in the zoos: Case study on Lion tailed macaque" the needs of animals and animal housing. At the same time, very clearly, gave details on behavioural study of animals.

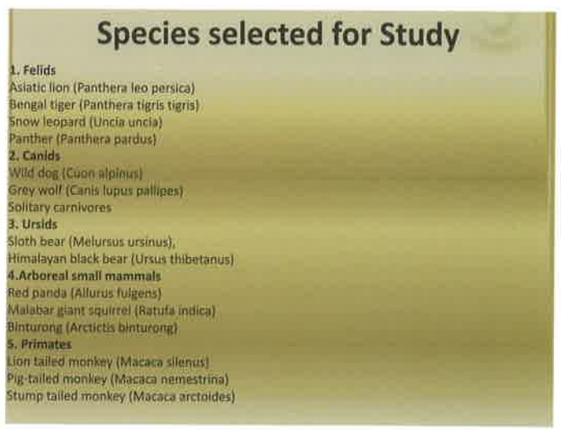
Assessment of Housing and enrichment requirement for animals in the zoos: Case study on Lion tailed macaque

- by PC Tyagi









Species selected for Study

Rhesus macaque (Macaca mulatta)
Phayre's leaf monkey (Trachypithecus phayrei)
Nilgiri langur (Semnopithecus johnii)
Common langur (Semnopithecus entellus)
Golden langur (Trachypithecus geei)
Hoolock gibbon (Hoolock hoolock),
Mega-herbivores
6.Reptiles
King cobra (Ophiophagus Hannah)
Painted roof turtle (Chrysemys picta picta)
Crocodilian species (includes three species; Gharial, Mugger and estuarine/salt water crocodile)
Rhinoceros (Rhinoceros unicornis)
Indian bison (Bos gaurus)
Indian elephant (Elephas maximus)
7.Herbivores
Wild ass (Equus hemionus khur)
Swamp deer (Rucervus duvaucelii)
Sangai (Rucervus eldii eldii)
Sambar (Rucervous unicolor)
Chital (Axis axis)
Mouse deer (Tragulus meminna)

Zoos Selected

1. Sakkarbaug Zoo
2. Nehru Zoological Park
3. Van Vihar National Park Zoo
4. Arignar Anna Zoological Park
5. Indira Gandhi Zoological Park
6. Sri. Chamarajendra Zoological Park
7. Lucknow Zoo
8. Padmaja Naidu Himalayan Zoological Park
9. Pt. Govind Ballav Pant High Altitude Zoo
10. Himalayan Zoological Park
11. National Park – Bannerghatta Zoological Garden
12. Malsi Deer Park
13. Kanpur Zoo
14. Sri Venkateswara Zoological Park
15. Rajiv Gandhi Zoological Park and Wildlife Research Center
16. 1 Dr. K. Shivarma Karanth Pilikula Biological Park
17. Sepahijala Zoological Park, Assam State Zoo Cum Botanical Garden
18. Thiruvanthapuram Zoo
19. Aizwal Zoo
20. Rajiv Gandhi Zoological Park And Wildlife Research Center
21. Alipore Zoological Garden
22. Indira Gandhi Zoological Park
23. Bondla Zoo
24. Manipur Zoological Garden
25. Sarahan Pheasantry
26. Pinjore
27. Kamala Nehru Zoological Garden
28. Madras Crocodile Bank Trust
29. Nandankanan Biological Park

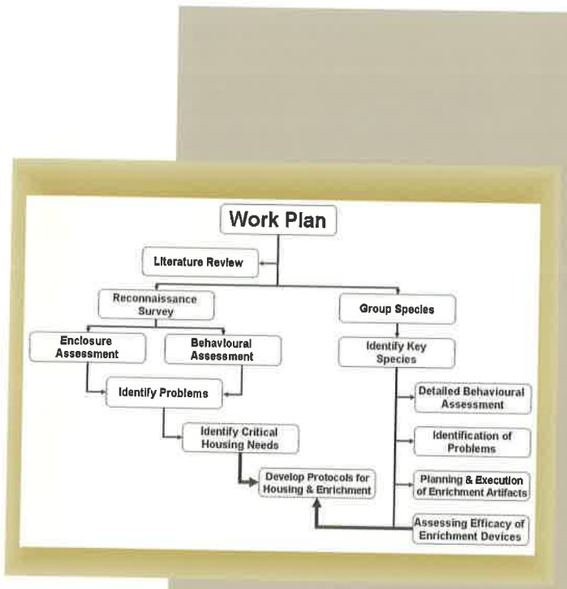
Species selected for Study

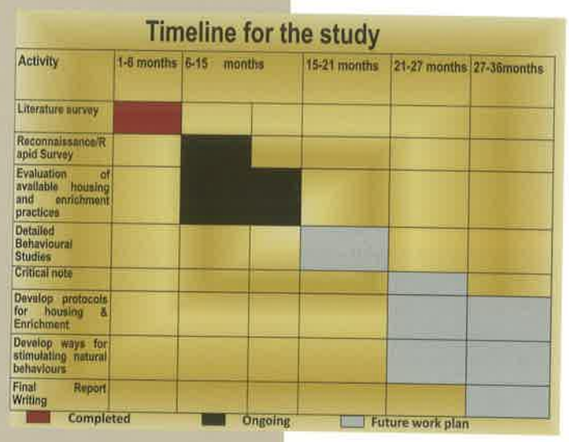
8.Aves
Himalayan monal (Lophophorus impejanus)
Cheer pheasant (Catreus wallichi)
Hume's pheasant (Syrmaticus humiae humaie)
Blyth's tragopan (Tragopan blythii)
Western tragopan (Tragopan melanocephalus)
Grey jungle fowl (Gallus sonnerati)
Vultures (White backed Vulture, Himalayan Griffon Vulture, etc.)
Nicobar pigeon (Caloenas nicobarica)

Study on Housing and Enclosure Enrichment of Some Species in Selected Indian Zoos

Project Objectives

•Conduct a literature survey for the selected species pertaining to housing and their enclosure enrichment.
•Evaluation of available housing and enrichment practices for aforesaid species in India and abroad.
•Prepare a critical note for each species providing detailed notes on:
•Appropriate housing
Habits,Behaviour, Social, Feeding, Reproductive
Other requirements in the wild and how they can be met in captivity
Develop protocols for housing and the types of enrichment artifacts that can be used.
Develop ways by which the natural behaviours can be stimulated in the identified species.





Methodology

A review of literature addressing the following issues has been carried out and compiled the same is being currently edited.

- The habitat preferences and distribution of free ranging conspecifics.
- The behaviour/activity pattern of free ranging conspecifics.
- The existing best practice guidelines for the species.
- The welfare of the species in captivity
- The existing housing, husbandry and enrichment practices in captivity across different zoos.
- AZA
- BIZAA
- WAZAA
- Zoolex
- Shape of Enrichment

Questionnaire Survey of Housing and Enclosure Enrichment

Enclosure details	
No of enclosures:	
Enclosure Area (if more than one enclosure for the species area of each enclosure) :	
Enclosure Dimensions (if more than one enclosure for the species dimensions of each enclosure):	
Number of Animals in the Enclosure:	
Enclosure Substrate (Sand, Earth, Gravel,Cemented flooring, Rocks / boulders)	
Type of Enclosure Barrier: (Moat, Dry, Wet, Pipe, Chain-link Mesh, Welded mesh, others - please specify)	
Dimensions of Enclosure Barrier:	
Rough sketch of the barrier may be provided on a separate sheet:	
Enclosure Sketch (provide on a separate sheet)	
Enclosure Drainage:	
Is the enclosure free of waste like animal faeces, garbage, fallen branches etc.	

Questionnaire contd

Remarks:	
Retiring area	
Number of Retiring Cells:	
Dimension of retiring cells:	
Substrate of Retiring cells (Earth, Wood, Cemented flooring, Others – describe in details):	
Sketch of the retiring cell may be provided on a separate sheet:	
Does the retiring area have adequate ventilation	
Is a squeeze cage available for treatment of animals with the retiring cells:	
Does the retiring area receive direct sunlight at least for a part of the day? Include aspect:	
Nutrition and drinking water	
Availability of drinking water in the enclosure and the retiring cells:	
Total quantity of feed provided:	
Feed constituents and quantities (please provide on a separate sheet)	
Food Presentation (Wholecut):	
Feeding frequency & time:	

Questionnaire contd

Where is the feed given? (Enclosure/ kraal/ retiring cells)	
Vegetation Type in the Enclosure:	
Tree Species:	
Approx height of trees in the enclosure:	
Species of Shrubs in the enclosure:	
Are plants/ trees are used for foraging (give details)	
Captive animal behaviour	
Social hierarchy of the animals living in the enclosure:	
Does the animal keep pacing in the enclosure (Walking along fixed paths repeatedly)	
Does the animal have frequent aggressive interactions with other inmates of the enclosure?	
Does the animal keep biting or clawing itself to cause injuries?	
Any other behavioural observations (please describe)	
Enclosure enrichment	
Type of enclosure enrichment devices:	
Provide rough sketches	
Use of enclosure enrichment devices:	

Pilot Study on 10 Species in Six South Indian Zoos

List of Species Studied:

1. Wild Dog
2. Common Langur
3. Nilgiri Langur
4. Lion-tailed Macaque
5. Asiatic Lion
6. Bengal Tiger
7. Sloth Bear
8. Himalayan Black Bear
9. Gaur
10. Stump-tailed Macaque

Period of Study: July-August 2011

Reconnaissance Survey:

- Filling up Questionnaire
- Evaluation of available Housing & Enrichment Practice
- Behavioral repertoire through
  - Ad-libitum sampling (Altman, 1974)
  - Focal Animal Sampling(Altman, 1974)

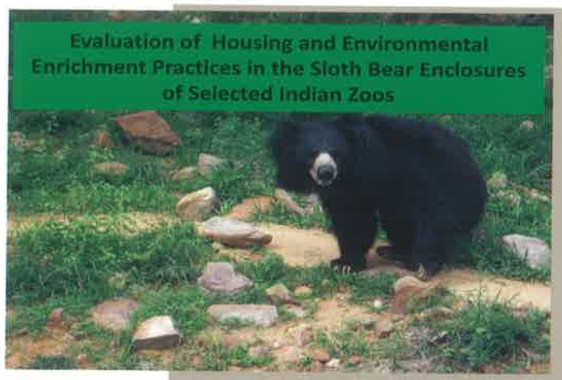
Behaviour Sampling Method

- First day *ad-libitum* sampling(Altman,1974) followed by preparation of list of most commonly seen behaviours.
- Focal sampling for 15 minutes with 5 minute interval for 136 hours between 0900-1700 hrs (Altman, 1974).
  - Only behavior data from low visitor-disturbance days was used for analysis.

Evaluation of Housing and Enrichment Practices in Zoos Through Reconnaissance Survey

Parameters:

1. Habitat
   - i. Distribution
   - ii. Home range
   - iii. Daily movement
   - iv. Spatio-temporal movement pattern
2. Social organization
3. Animal Biology
   1. Life span
   2. Feeding Ecology
      - i. Food preference
      - ii. Feeding regime
   3. Breeding biology
      1. Age at first breeding
      2. Inter-birth interval
      3. Infant mortality



Sloth Bear (*Melursus ursinus*)

Kingdom	Phylum	Class	Order	Family
Animalia	Chordata	Mammalia	Carnivora	Ursidae

- Distribution throughout India.
- Found in over 41 zoos all over India.
- Lifespan in captivity 30 years.
- There are over 594 individuals in captive condition including those in the rescue centers.
- Intelligent animals need more care.

Objective

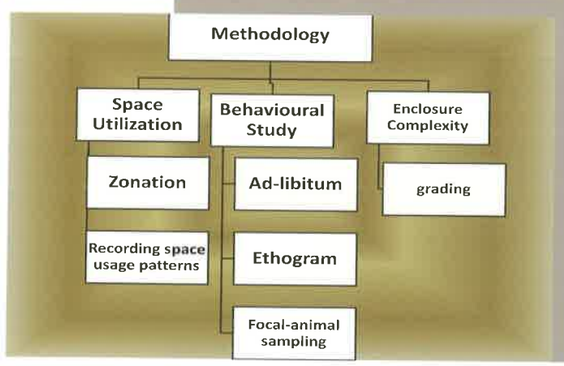
- **Assess Enclosure complexity**
  - Enrichment devices
  - Space availability
  - Vegetation
- **Determine parameters affecting behaviour**

Zoos Selected for Study

- Arignar Anna Zoological Park, Chennai
- Sri Chamarajendra Zoological Gardens, Mysore
- Sri Venkateswara Zoological Park, Tirupati

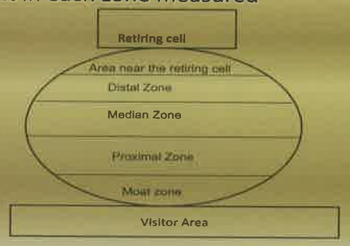
Time period: July 2011-August 2011

Methodology



Space Utilization

- Enclosures divided into 5 zones and the time spent in each zone measured



Behaviour Sampling Method

- First day *ad-libitum* sampling(Altman,1974) followed by preparation of list of most commonly seen behaviours.
- Focal sampling for 15 minutes with 5 minute interval for 136 hours between 0900-1700 hrs (Altman, 1974).
  - Only behavior data from low visitor-disturbance days was used for analysis.

Most Common Behaviours shown by the Sloth Bears

Behaviour	Description
Foraging	Digging around the enclosure looking for food
Movement	Individuals moving around the enclosure non-repetitively in the horizontal or vertical manner.
Aggression	When two or more animals are involved in a conflict
Inactive	The animal is lying around in the enclosure not performing any other behaviour.
Interaction with Enrichment Devices	If the animal interacts with the environmental enrichment devices
Stereotypy (Zoochosis)	Pacing, Head swaying and weaving.
Others	Scratching, defecating, urinating, any other unlisted behaviour

Foraging

Use of Vegetation

Use of Enrichment Devices

Data Analysis

- **Binomial Regression in Generalized Linear Model, (Vickery, 2004)**
  - Dependent variable
    - Proportion of time spent on different behaviors
  - Independent variable:
    - Time till feeding /Time till closing
    - Zoo paramters (enrichment devices and enclosure space)

Subjects of Study

ZOO	Number of animals	Sex	Age Class
Arignar Anna Zoological Park, Chennai	3	M	Adult
		F	Adult
		U	Cub
Sri Chamarajendra Zoological Garden, Mysore	3	M	Adult
		M	Adult
		M	Adult
Sri Venkateswara Zoological Park, Tirupati	2	M	Adult
		M	Adult

Enclosure Complexity Scoring

Enrichment devices	Score	Vegetation	Score
0-10	1	0-10	1
10-20	2	10-20	2
20- above	3	20- above	3

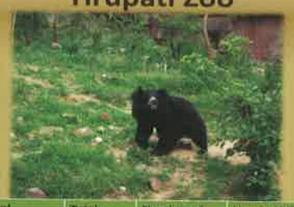
Chennai Zoo

Name of Zoo	Total enclosure space(m^2)	Total space m^2/ animal	Number of Trees/saplings	Number of Environmental enrichment devices	Enclosure Complexity
Chennal Zoo	2238 m^2	280m^2	20	10	4

Mysore Zoo

Name of Zoo	Total enclosure space(m^2)	Total space m^2/ animal	Number of Trees/saplings	Number of Environmental enrichment devices	Enclosure Complexity
Mysore Zoo	804	208	5	2	2

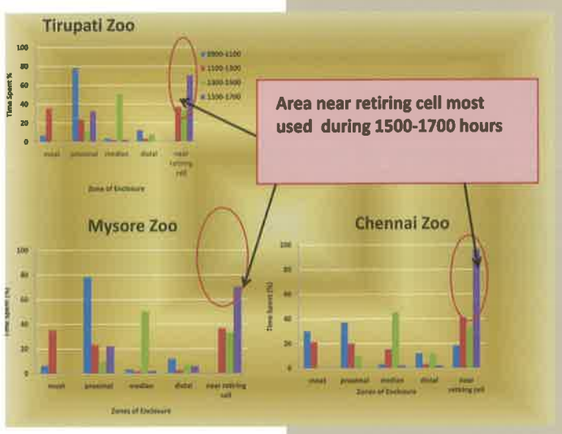
Tirupati Zoo



Name of Zoo	Total enclosure space(m^2)	Total space m^2/ animal	Number of Trees/saplings	Number of Environmental enrichment devices	Enclosure Complexity
Tirupati Zoo	3457.7 m^2	1157.7	75 saplings	2	2

Summary of Enclosure Complexity

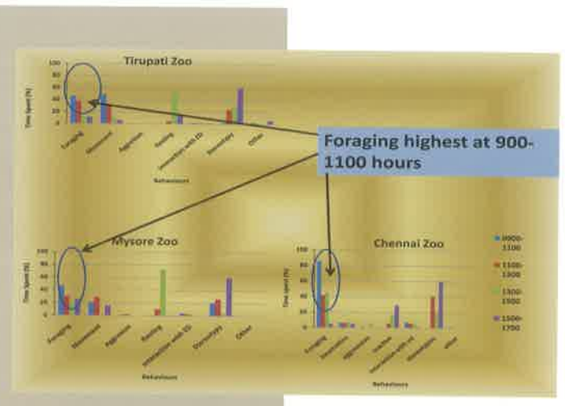
Name of Zoo	Total enclosure space(m^2)	Total space m^2/ animal	Number of Trees/saplings	Number of Environmental enrichment devices	Enclosure Complexity
Chennal Zoo	2238 m^2	2	20	10	4
Mysore Zoo	804m^2		5	2	2
Tirupati Zoo	3457.7 m^2		75	2	2

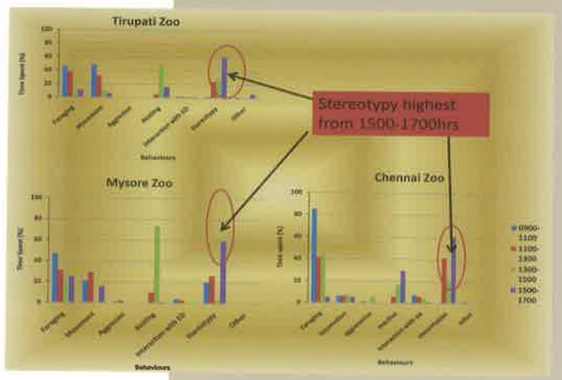


Observations

- Space utilization pattern shows preference for retiring and median areas.
- Stereotypic behaviour most commonly observed near the retiring cell.

Time Budget Patterns in the Three Zoos





Observations

- Foraging behaviour peaks in the morning
- Stereotypy(Zoochosis) peaks before feeding and closing time.
- After feeding most animals are inactive

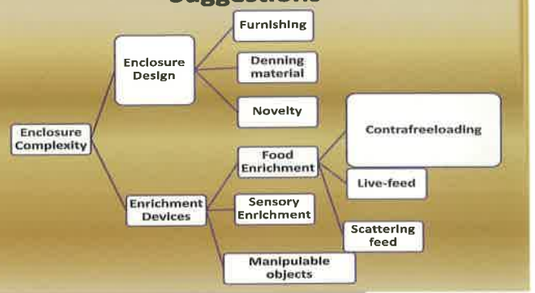
Inference

- **Activity patterns vary spatio-temporally**
  - Foraging peaks observed near moat and proximal end and especially after release.
  - Stereotypy peaks prior to feeding time (1hr) and near closing time when feed is again presented near the retiring area.
  - Large Enclosure space without complexity does not reduce stereotypy.

Probable Reasons for Spatio-temporal Fluctuation in Behavioral Patterns

- Rigid feeding regimen
  - Same feed
  - Same time
- Large enclosure space with less Enclosure complexity
- Absence of Enclosure Novelty

Suggestions



Enrichment Plan based on Detailed Behavior Assessment for Housing and Enrichment Requirements of Each Group

1. Identifying Key species in Each group
2. Identify Zoo for study
   a) Number of animals in the social group
   b) Optimum housing and enclosure conditions
3. Determine timeline for study of
   a) pre-enrichment 8 groups in 2 seasons wet & dry (64 days).
   b) Post enrichment study will commence after setting up enrichment/artifacts and giving the animals time for habituation(15-30 days).
   c) Post-enrichment 8 groups in 2 seasons wet & dry (64 days).

Environmental Enrichment

Environmental enrichment is the provision of stimuli which promotes the expression of species- appropriate behavioural and mental activities in an under-stimulating environment. (Reinhardt, 1999)

Forms of enrichment

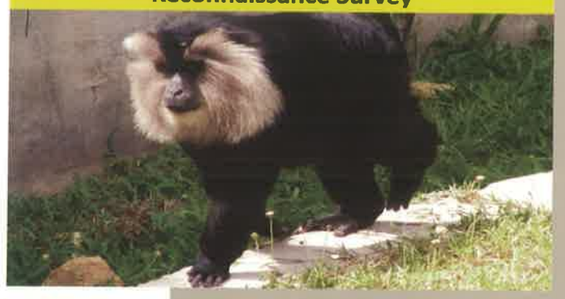
- **Sensory**
- **Manipulative**
- **Feeding**

Artifacts to be used for Sloth bears

Stimulating Natural Behaviour in Animals

1. Freedom from hunger and thirst
2. Freedom from pain and injury
3. Freedom from discomfort
4. Freedom from fear and distress
5. Freedom to express normal behaviour

Study on Lion-tailed Macaque Through Reconnaissance Survey



Lion-tailed Macaque

- Arboreal group-living animal
- Dwells on the upper canopy of forests
- Eats fruits, leaves, insects etc. with a preference for frugivory.
- Generation length: 13 years
- Major threat: habitat fragmentation

Biology of Lion-tailed Macaque

	In-situ	Ex-situ
Life span	20 years	38 years
Age at first birth	Female 6 years, male 8 years	Female 4 years, male
Litter size	1	1-2
Inter-birth interval	30 months	5 months
Mating season	January-April	Throughout the year
Mating system	Polygynous	Polygynous

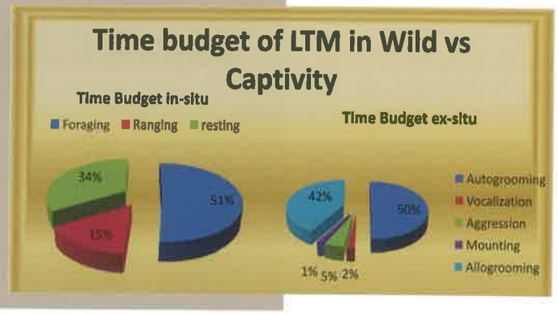
Biology of Lion-tailed Macaque cont.

	In-situ	Ex-situ
Social structure	Matrilineal hierarchy	Matrilineal hierarchy
Group sex ratio	Male:Female= 1:2.11, Adult:Young=1:0.84	
Dispersal pattern	Females show philopatry and males disperse	
Birth rate	low	Higher than wild because of food provisioning
Mortality rate(infants)	low	0.13

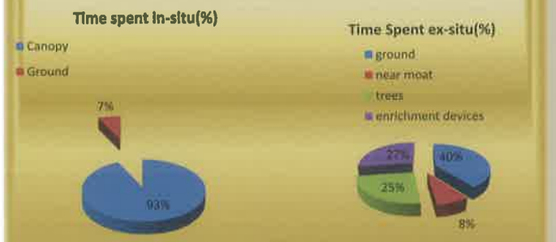
Ecology of LTM

	In-situ	Ex-situ
Home range	605-2307sqm	
Daily movement	605-2307m	
Activity pattern	Bimodal diurnal, peaks early morning and before sunset	
Preferred food plants	*Cullenia sp, Pallaquium ellipticum, Ficus sp, Turpinia malabarica*	

Time budget of LTM in Wild vs Captivity



Time Spent on Different Substrates Wild vs Captivity



Evaluation of Housing Condition of LTMs

Time budget of LTM in Captivity (AAZP)

ACTIVITY	BAMA	APSARA	VIJI	ANITHA	MALA	RANI
Autogrooming	50.20%	65.65%	71.86%	77.77%	68.37%	45.04%
Vocalization	1.89%	12.12%	1.70%	0.00%	8.54%	4.95%
Aggression	5.02%	2.69%	3.12%	0.00%	12.82%	2.06%
Mounting	1.33%	1.34%	3.40%	2.02%	0.00%	4.13%
Allogrooming	41.60%	18.18%	20.73%	20.20	10.25%	42.97%
Total	239	297	352	99	117	242
T-%	100%	99.99%	100%	99.99%	99.99%	100%

Enclosure complexity

Enrichment devices	Score	Vegetation	Score
0-10	1	0-10	1
10-20	2	10-20	2
20- above	3	20- above	3

Number of enrichment devices

Enrichment devices
Arboreal pathways
Perches
Ladder
Dry logs
Shelter

Arignar Anna Zoological Park

Total area	Shape	Moat type	Number of trees	Number of enrichment devices	Enclosure Complexity
111.46sqm	circular	wet	15	23	5

Diet of LTM in captivity

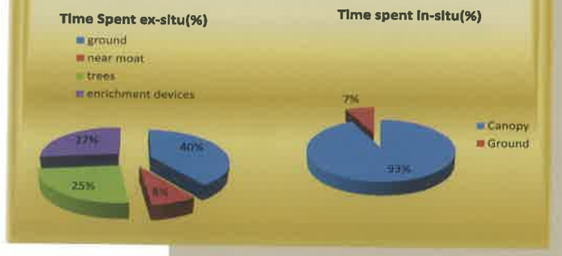
Chennai Zoo

Boiled Rice	Groundnut	Orange	Banana	Mango	Guava	Cabbage	Bengal Gram	Greens	Bread	Boiled Egg	Soya bean with Vitamins	Carrots
.025	.025	1/2	3	1	2	.050	.015	.05	2	1	.02	.025

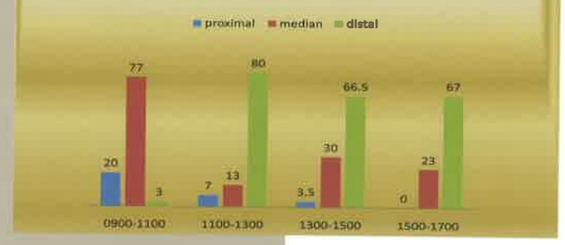
Mysore Zoo

	Bread (kgs)	Apple (kgs)	Cabbage (kgs)	Tomatoes (kgs)	Seasonal (kgs)	Beans (kgs)
Adult	0.075	0.100	0.050	0.030	0.100	0.025
Sub-adult	0.050	0.050	0.025	0.015	0.050	0.010

Time Spent on Different Substrates



Enclosure Space Utilization in LTM



Diet of LTM in Wild

Preferred Food Plants	diet %
Cullenia exarillata	20.74
Palaquium ellipticum	7.40
Ficus beddomei	5.52
Dryeptes elata	3.99
Macarnaga indica	3.63
Elaeocarpus tuberculatus	2.93
Ficus microcarpa	2.74
Turpinia malabarica	2.64
Syzgium cumini	2.55
Ficus nervosa	2.47
Animal matters	9.09

Preferred fruits in LTM diet

Cullenia fruit

Ficus microcarpa fruit

Mangifera indica fruit

Dryeptes elata fruit

Sri Chamarajendra Zoological Garden

Total area	Shape	Moat type	Number of trees	Number of enrichment devices	Enclosure Complexity
>100sqm	circular	dry	4	7	2

Enclosure Recommendations

1. Size of the enclosure
2. Shape of enclosure
3. Substrate
4. Barrier design
5. Moat type
6. Night house design
7. Vegetation

Housing Recommendations

- Social housing
- Area of 500sqm per pair and 20sqm more for every additional animal.
- Trees taller than 5m with interconnected branching should be placed in the enclosure.
- If the canopy is not inter-connected arboreal pathways can be created.

Size of the Enclosure

1. Home range of a LTM group in wild
2. Daily movement pattern of the animals in wild
3. Habitat utilization by LTM group in wild.
4. Spatio-temporal activity pattern by the group in captivity.
5. Time spent on ground.
6. Vegetation in the enclosure.

Shape of the Enclosure

1. The LTM enclosure should be ellipsoid in shape so that in case of aggression there is sufficient withdrawal area.
2. The retiring cells should be at the distal end of the enclosure and its entry should be camouflaged.
3. The enclosure should not have more than 50% area open for visitor gallery with a view to reduce disturbance.
4. Proper landscaping to facilitate drainage of excess water and creation of visual barrier.

Substrate of Enclosure

1. The enclosure should have natural substrate which facilitates growth of vegetation and drainage.
2. The enrichment devices present within the enclosure should be fabricated from organic materials.
3. Materials with sharp edges should not be incorporated in the construction.

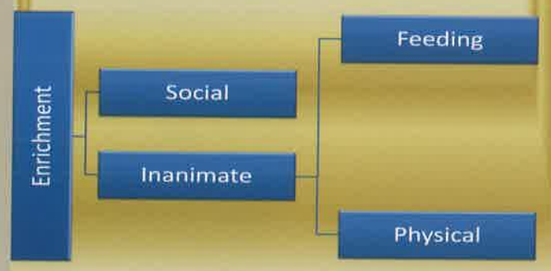
Barrier Design

Moat: Preferably dry to increase enclosure space and reduce chances of water-borne diseases.
Dry Moat dimensions: Width 5.5m and Height 3m
Stand-off Barrier & Size of Hedge: sufficient to prevent a view of the moat. The inner edge of the moat should be at the same elevation as the standoff barrier.

Retiring cells

1. 30 cubic meter (4mx6mx4m) for each group should be there.
2. Perches/ platforms should be present in the retiring cells.
3. The retiring cells should have inclined flooring so that urine does not stagnate and flows into drains.
4. Wooden platforms should be placed to keep the animals warm and reduce chances of fecal contaminations.

Enrichment Recommendations



Social Enrichment

1. Socially housed animals are less likely to show aberrant behaviour.
2. social housing might facilitate breeding.
3. Social housing reduces self-directed aggression

Feeding Enrichment

- Feeding schedule of the LTM should mimic their feeding behaviour in the wild
- There are two major feeding bouts in wild.
- Rest of the day animals have insects and other food matters of low-nutrient value.
- Daily ration should be given once early in the morning and again in the late-afternoon.
- Feed should be hidden to promote foraging behaviour and increase the spatio-temporal usage of under-utilized areas.
- Whole/uncut fruits should be scattered in the enclosure to increase processing time.

Physical Enrichment

1. Swings
2. Perches
3. Arboreal pathways
4. Water baths
5. Manipulable objects

Enrichment devices






Utilization of Enrichment Devices

1. Assessment of Enrichment Usage is vital to the success of an enrichment plan.
2. Behaviour studies pre and post-enrichment should be conducted and entered in the format.

TIME INTERVAL	NUMBER AT	REST	ALERT	MOVE	FEED	INTERACT	EXPLORE	MANIPULATION	ACTIVITY		OTHER, WHAT???	COMMENTS

E2S2: Efficient Exhibits for Species Survival
Speaker : Dr. Brij Kishor Gupta, Central Zoo Authority, New Delhi

Dr. Brij Kishor explained about importance of exhibits and enclosures for survival of animals in his presentation "E2S2: Efficient Exhibits for Species Survival" and emphasized on the best naturalistic exhibits in Indian Zoos.

Efficient Exhibits for Species Survival (E2S2)

- by Dr Brij Kishor Gupta

Zoos in India: Menageries to Naturalistic enclosures

History

The first public zoo was established in India at Madras in 1855, well after Britishers had landed in India. It was followed by establishment of a zoo at Byculla, Mumbai in 1863. Spurred by the initiatives of establishing the zoos at Madras and Bombay by the Britishers, the Ruling Kings of various princely states of India went for establishing zoos in their own states too during the latter half of nineteenth century.

They are Marble Palace Zoo (1894), Trivandrum Zoo (1857), Junagarh Zoo (1869), Jaipur Zoo (1876), Udaipur Zoo (1878), Baroda Zoo (1879), Thrissur Zoo (1885) and Mysore Zoo (1892). The trend continued and the zoos established in the first quarter of 20th century are Gwalior Zoo (1902), Kota Zoo (1905), Bikaner Zoo (1922). Jagirdars of Avadh established Prince of Wales Zoo, Lucknow (1921) to commemorate the visit of Prince of Wales to India. Bellilius Deer Park and Jogmaya Deer Park were established in 1936. Thus at the time of independence (1947) there were 18 zoos in India.

Like elsewhere in the globe the objective the zoos was displaying the wild animals in park like settings and satisfy the public curiosity by exhibiting as many species of wild animals as possible, representing different continents of the world. As the wildlife was plentiful and no restrictions for acquisition of wild animals from the natural ecosystems, the longevity and health of the animals displayed by the zoo was hardly an area of concern.

Keeping up with global trends, Government of India also started making efforts to enhance the role of the zoos, from mere entertainment to conservation of the Species, soon after India becoming a Democratic Republic. The Indian Board for Wildlife resolved in 1952 that the Central Government should set up a modern zoo in each of the major cities of the country for educating the people on the rich fauna of the country and the need to conserve it. By 1960, 4-5 such Zoos were established in the States of Delhi, Andhra Pradesh, Orissa and Assam.

However, the traditional perception of viewing zoos as mere centres of recreation continued to prevail and the new Zoos and deer parks established, cared little to provide requisite financial and technical inputs required for planning management of the new Zoos created with wild animal displaying facilities.

Being concerned about the disturbing trend of unplanned establishment of new zoos, Central Government appointed a committee of Zoo experts under the Chairmanship of Dr A P Kapoor, Director, Zoological Survey of India on 19th June, 1973 to study the zoos and formulate norms, considering the overall area of the zoo, the space available for animals in individual enclosures and facilities available for feeding the animals. The Committee finalized its recommendations which were accepted by the Government of India in November 1973, and are relevant even today.

The specific manpower required for the Zoos is as follows:

(i) The Zoo Director: should be a full time officer-in-charge of the zoo operations at the site.
(ii) Second Officer: to assist the zoo director on day-to-day functioning and holding the post in absence of the director.
(iii) Curator (In case of category 'A' zoos): for various animal branches and he should have appropriate technical qualifications and requisite training.
(iv) Full time Veteranian (in case of Category A and B zoos): as in-charge of the hospital, quarantine facility, animal health and hygiene. He should be responsible for checking the quality of food also. There should be specialized training courses on wild animal healthcare for the zoo veterinarians.
(v) Full time officer (In case of Category 'A' zoos): for educational activities.
(vi) Adequate promotional avenue: The promotions should be associated with various trade tests and training courses proposed.
(vii) Frequent inter-change programmes of staff: between various zoos for fairly long periods to widen the outlook and enhance the technical skills of each personnel. Adequate financial incentive should be provided to staff during such interchange programmes, to mitigate the financial hardships that they may face.

The area required is minimum 50 hectares. There is a need of providing the zoo animals sufficient space for their movement and exercise and meeting their biological requirements. The soil, water and vegetation of the animal enclosures should be appropriate to make the animals homely. Also, every animal species should be provided with an environment as close to their natural habitat as possible.The comprehensive guidelines about designing of animal enclosures should be followed. For care for feeding upkeep, hygiene and breeding of endangered species following recommendations should be followed :

(i) Enclosures should be sufficiently large to give fullest opportunity for breeding rituals like chasing, dancing and exploration.
(ii) Enclosures should have hiding places and privacy of the animals.
(iii) Enclosures should simulate the natural habitat of the animal housed as closely as possible.
(iv) Availability and adequate breeding stock with appropriate sex ratio should be ensured.

(v) Careful observation on animal behaviour and adequate technical knowledge on the part of the zoo staff is the key to successful breeding of endangered species. Manipulation in the form of matching comparable pairs and changing animals partners, bringing animals together at the right time and acting judiciously in case of fights etc. are necessary to successful breeding.
(vi) In case of incomparable pairs, exchange of animals/ loaning of animals should be tried. Use of Artificial Insemination should be tried in special cases.
(vii) Collection and dissemination of data in detailed formats provided for recording observations on various aspects of zoo management are proved useful.

Era of Mushrooming of unplanned and Substandard Zoos

There was mushrooming of in-appropriately planned Zoos with cramped space and inadequate animal care. Some Zoos had excellent layout plans and very well designed enclosures for various species of wild animals housed by the zoos. The knowledgeable visitors expressed pleasure to see these zoos. However, the State Governments could not grant approval to them, only because of their picturesque locations when they had cramped menageries. World Bank funding gave a further boost to this trend of setting up of mini zoos and Deer parks. Though they had all the norms fulfilled, the paucity of budgets plagued such zoos. Even some large and well managed zoos became victims of poor maintenance and sub-standard upkeep and healthcare of zoo animals, due to this reason.

The following Zoos require special mention in terms of adequate space and appropriately designed enclosures in 1970s and 80s:
Indira Gandhi Zoolgical Park, Visakhapatnam Zoo (1972- 250 hectare), Kanpur Zoo (1971-76.5 hectare), Mahendra Chaudhary Zoological Park, Chhatbir, Chandigarh (1977- 202 hectare), Sanjay Gandhi Zoological Park, Patna (1973-61.00 hectare), Arignar Anna Zoological Park, Chennai (1985-602 hectare) and Sri Venkateswara Zoological Park, Tirupati (1987- 400 hectare).

The Central Government did try to help through new centrally sponsored schemes, namely, 'Development to zoos' and 'Assistance for conservation of endangered species of wild animals' under the VIIth Five Year Plan. But it was on 50:50 basis, so many states did not show any interest. Some Chief Wildlife Wardens in a few states took the advantage of the schemes to improve the zoos.

Setting up of Central Zoo Authority

Due to this situation of no qualitative improvement of zoos in the country, it was decided that the Central Government would set up the Central Zoo Authority through the amendment of Wild Life

(Protection) Act in 1991, and made a provision that no zoo in the country function without getting prior recognition of the Central Zoo Authority, which came into existence in February, 1992. It was also provided in the Act that recognition would be granted to the zoos only having due regard to the interest of conservation of wildlife.

The latest update on authorities which have been accorded permission by the Central Zoo Authority and Hon'ble Supreme Court of India are following for the establishment of new zoos:

S No	Name of the Zoo & Place	Controlling Authority	Present Status
1	Night Safari, Greater Noida (Uttar Pradesh)	Greater Noida Industrial Development Authority (GNIDA), Greater Noida	Approval from CZA and Supreme Court obtained. Financial and Technical Advisor is being appointed by GNIDA. Expression of Interest is being floated by GNIDA for selection of applicant to develop Night Safari in PPP model.
2	Lion Safari at Etawah (Uttar Pradesh)	Uttar Pradesh Forest Department	Approval from CZA and Supreme Court obtained.
3.	Leopard Rescue Centre at Ahmednagar (Maharashtra	Forest Department of Maharashtra	Approval from CZA and Supreme Court obtained.
4.	Gorakhpur Zoo, Gorakhpur (Uttar Pradesh)	Forest Department of Uttar Pradesh	Relocation of Vinod Van Mini Zoo, Gorakhpur – Pending with State Govt. of U.P.
5.	Zoo and Rescue Centre at Mukundpur, District Satna (Madhya Pradesh)	Forest Department of Madhya Pradesh	Approval from CZA and Supreme Court obtained
6.	Leopard Safari at Roha (Maharashtra)	Yashomala Farms Pvt. Ltd. and Maharashtra Forest Department	Approval from CZA and Supreme Court obtained

It is also worth mentioning that though the many zoos/forest dept. of states in India would like to add the Night Safari, Bird Park and other specialized facilities as an added attraction to the area available adjoining. Despite of a lot of correspondence with CZA, many meetings with consultants and visits to Night Safari at Singapore, Chaing Mai (Thailand) and Malaysia carried out; and crores of Rupees spent but none could materialize due to administrative problems.

The examples of such zoos are following:

S No	Name of the Zoo & Place	Type of specialized attraction proposed
1.	Arignar Anna Zoological Park, Vandalr	Night Safari
2.	Bannerghatta Biological Park, Bangalore	Night Safari
3.	Bhagwan Birsa Biological Park, Ranchia at Barwe PF	Night Safari
4.	Forest Dept. of Andhra Pradesh at Hyderabad	Night Safari for Exotic Animals
5.	Forest Dept. of Andhra Pradesh at Hyderabad	Bird Park for exotic birds
6	Sri Venkateswara Zoological Park, Tirupati	Night Safari
7.	Gorewada Zoo and Rescue Centre at Nagpur	Night Safari and others
8.	Forest Department of Sikkim	Bird Park
9.	Kamla Nehru Zoological Garden, Ahmedabad	Night Safari
10.	Chidiyatapu Biological Park, A & N Islands	Canopy Walk & Oceanarium
11.	Assam State Zoo, Guwahati	Night Safari

Why Exhibits for Species Survival:

Today it has become mandatory for zoos to prove their existence by way of its animal exhibits, its conservation education programmes and its conservation breeding of the endangered species. Success of the Zoos is achieved not by the quantity of exhibits but the qualitative exhibits.

The Central Zoo Authority functions under the Wild Life (Protection) Act, 1972, and has adopted the following line of action to discharge the mandatory functions and to provide proper direction and thrust to the management of all the zoos in the country:

(1) Specification of standards and norms for housing, upkeep, health care and other issues related with zoo management.
(2) Evaluation of zoos with reference to the specified standard and norms and grant/ refuse recognition to the evaluated zoos with due regard to the interests of wild life conservation.
(3)Facilitate and monitor the recognized zoos in compliance of conditions stipulated in the letter of recognition, particularly, the ones related to housing, upkeep and health care of zoo animals.
(4) Upgrading the technical skills of the zoo personnel at various levels of zoo hierarchy through training programmes and workshops.
(5) Encouraging zoos to exchange, loan, pool the animals available in their stock in the best inter-

est of conservation and approve the proposals that are in accordance with the guidance issued by the Central Zoo Authority.
(6) Facilitate zoos in identifying priority and themes of display of wild animals held in their stock with the objective of enhancing the conservation value of zoos.
(7) Identification of endangered species for planned conservation breeding and identification of zoos to carry out the breeding programmes.
(8) Helping zoos in carrying out the planned breeding programmes of identified endangered species by providing necessary technical know-how and infrastructure.
(9) Ensure maintenance of studbooks in respect of all animals pertaining to endangered species and to persuade zoos to avoid inbreeding through proper genetic management.
(10) Encourage and facilitate zoos in carrying out research aiming on improving the performance of zoos in breeding of endangered species and imparting conservation education to the visitors.
The initiatives taken and the progress made by the Central Zoo Authority on each action point are briefly summarized under:

Master Plan:

Over the last few decades, the Zoo master plan has evolved from a document organizing the institution specially, to one that deals with issues of management, maintenance, revenue generation, education, and wildlife conservation. This is in keeping with the increasingly complex roles of zoos, from institutions with taxonomic displays of fauna to centers of conservation. An important aspect of a zoo master plan is that it is a development guide for the future, which is created to prevent ad-hoc decisions being made by changing zoo administrations, but at the same time has the flexibility to accommodate unforeseen conditions – new animal acquisitions etc.

A master plan may be created for a new zoological park on an undeveloped site, or it is created for an existing zoo, in order to reorganize the institution along the new lines of thinking, and provide a road-map for the future. In a manner similar to other architectural or landscape planning projects, the zoo master plan process involves multiple steps:

Naturalistic Exhibits vs Examples from Indian Zoos:

There has been time that during most talks or workshops always examples are provided for naturalistic exhibits from foreign countries, but the time has changed, several naturalistic, open, management friendly, visitor friendly and animal friendly exhibits have been constructed in our country. The credit goes to Central Zoo Authority (under Ministry of Environment & Forests, Government of India), forest officials to name Pushp Kumar, T Ramakrishna, SC Sharma, Sarok K Patnaik, JH Desai, Sally Walker and many more stalwarts who have been associated with the Authority since beginning and had shown direction to the zoos in the last 20 years and not the least our fellow zoos,

zoo directors who had put their hard work to make these exhibits to turn into the reality. The examples from various zoos are given below:

Sepahijala Zoological Park, Sepahijala, Tripura

Sepahijala Zoological Park in Tripura situated in close proximity of Clouded leopard Sanctuary has provided immersion exhibits for most species. The zoo has access to areas with good forest cover, full of large trees which provides adequate area to perform animal their natural behavior.

Pig tailed macaque Exhibit

The Pig-tailed macaque enclosure is one of such example from Sepahijala where the animal enclosure is such that you see the animals live in wild habitat. Infact, it is also true that many times, you may see the Pig-tailed macaque from the wild living in the adjoining areas of the zoos and many times do visit the zoo premises too. The animal's biological behavior demands are also met in such enclosures.

Total area provided in the paddock	Depth of the enclosure	No of feeding retiring cells available
500 Sqmt	10.5 mt	3 (three)

Clouded leopard

Total area provided in the paddock	Depth of the enclosure	No of feeding retiring cells available
500 Sqmt	5.5 mt	3(three)

The Clouded leopard housed in open enclosure is always seen resting on a tree top, on a large log as they are seen living in wild. The animals are neither disturbed by visitors nor do they show any reaction to the visitors. Moreover, the animal looks like as you see them in wild. The enclosure has dry moat as barrier and is full of thick ground story vegetation as well as tall trees. However, the critical distance is being maintained between the trees used by the Clouded leopard and the moat

periphery, as in case they try to jump out. So far no such incidence has happened. The only disadvantage is that many times the animals do not come down even for their feed; therefore keepers are finding difficulty in cleaning the paddock area daily. The other disadvantage is that the feeding and retiring cells are not located towards visitor viewing area and so seen in ill-maintained state. Clouded leopard is also one of the identified species under the CZA's Conservation Breeding Programme and the Sepahijala Zoo has been identified as Co-ordinator of the Species.

Royal Bengal tiger

The Bengal tiger at the zoo are housed in a large enclosure which has natural vegetation, large trees as well bamboo groves, which provide animals to interact with the habitats and use the tree trunks to rub and scratch their body. Even the enclosure is being marked territorial as they do in the wild. The enclosure has only two disadvantages, one that viewing area is large for the visitors and the other that area housing animals is so huge that they are seen by the visitors and the same is not camouflaged. The enclosure has plenty of wooden logs for the animals to climb upon and sharpen their nails and scrub their body as and when the animal desires to do so.

Total area provided in the paddock	Depth of the enclosure	No of feeding retiring cells available
5040 Sqmt	5.50 mt	6(six)

Phrayes leaf monkey : Phrayes leaf monkey is one of the rarest primate of the NE and India. The CZA has identified it as one of the main species under the Conservation Breeding programme. Sepahijala Zoo is also selected as Co-ordinator zoo for the species, also know as Spectacled monkeys. The exhibit provides space to meet the animals natural locomotory behaviour, jumping from tree to tree, climbing and provides protection from rains and to hide as and when the dominant male chases other animals of the herd. The zoo has successful goof breeding too.

Total area provided in the paddock	Depth of the enclosure	No of feeding retiring cells available
500 Sqmt	2.5 mt	3(three)

Indira Gandhi Zoological Park, Vishakhapatnam

Indira Gandhi Zoological Park is one of the finest zoo in the country, designed by late Shri Pushp Kumar, who also designed other zoos in the state of Andhra Pradesh, at Hyderabad and Tirupati. The most of the zoo exhibits at Vishakhapatnam are the examples of the 'borrowing the landscape' concept.

Total area provided in the paddock	Depth of the enclosure	No of feeding retiring cells available
5058 Sq mts	22 mts	Seven

Tiger

The tiger exhibit at the Zoo, is provided with natural landscape with tall trees and thick bamboo groves. The most beautiful part of the exhibit is that it has lush green hillock full of vegetation as back drop of the exhibits, which makes the exhibit a perfect wilderness scenario.

Sloth bear

The Sloth bears at the Indira Gandhi Zoological Park, Vishakhapatnam are housed in a way similar to the one in the Sloth bear Sanctuary near Bellary in Karnataka. The enclosure has natural vegetation and rocks as one could see them in their natural habitat. It also is provided with ample opportunity for the bears to dig the soil and large dead tree logs to climb upon.

Indian Gaur

Gaurs are housed in thickly vegetated exhibit with dry moat as barrier. Though most plants in the exhibit are Eucalyptus, however, these plants are being replaced by the vegetation preferred by the Gaurs in the wild. The large trees provide animals to rub their body. The exhibit also has many shrubs which are being utilized by the animal for forage.

Total area provided in the paddock	Depth of the enclosure	No of feeding retiring cells available
14167 Sqmt	25 mt	four

Shivganga Garden Zoo, Thanjavur, Tamil Nadu

Zoo located in mythologically important area: Sambar Enclosure (Area 1200 sq mt)

The Sambar enclosure at Shivganga Garden Zoo being run by the Thanjavur Municipal Corporation. It may not fulfil most the conditions of the Central Zoo Authority norms, however, it is one of the few zoos which has their Sambar enclosure almost attached to its main world famous temple. The enclosure is large, open and also has few large trees for shade. The temple in the background provides tranquillity and revives the bond of Hindu Mythology and Animal Conservation together.

Dr. Shivram Karanth Pilikula Biological Park, Managlore, Karnataka

It is one of the zoos which was established only 20 years ago in 1980s and has achieved success in setting up a few very good exhibits. The zoo has also achieved success in breeding the King cobra in captivity as a part of ongoing planned conservation breeding programme funded by the Central Zoo Authority.

The landscaping carried out at the zoo is unique. The zoo does not allow fully paved areas for the visitors pathway. Thick bamboo grove can be seen all around the zoo planted along the pathway to provide screening between animal enclosures and visitors.

Maharaja Shahaji Chhatrapati Zoo, Kolhapur, Maharashtra

Exhibit Area: 3000+ square meters

Sambar

Though the zoo managed by the Maharaja of Kolhapur has in its collection a very few species, but the Sambar enclosure is being maintained in the heart of the city as if one is watching them in Wild. No one could say that this exhibit is next to the one of the busiest road in Kolhapur. The water body is totally naturalistic. The vegetation grown within exhibit meets 70% feed requirement of the animals. The animals are healthy and their number is maintained within the carrying capacity of the areas.

Kamla Nehru Prani Sangrahalya, Indore, Madhya Pradesh

Though this zoo receives so much criticism from the local NGOs and animal welfare activist, the newly built enclosures for White tiger and Sloth bears are very naturalistic. Only point is that the environmental enrichment provided needs to be looked into detailed manner. Some of the old enclosures still convey the epic of 'Ramayana'.

Bannerghatta Biological Park, Bangalore, Karnataka

The Banneghatta Zoological Park has a total of 320 hectares of area earmarked for the zoo. But the zoo is presently being worked upon to revise the master (layout) plan, which shall provide larger area for the animal enclosures and few new species will also be added. The zoo is known for its safari exhibits. The zoo has Herbivore Safari, Tiger Safari, Lion Safari & Sloth bear Safari. It also has few fairly large exhibits like Chinkara Enclosure.

Chinkara

The Chinakata enclosure is almost about 1600 sqm and has large trees, natural vegetation and natural rocks. The beauty of the exhibit is that it also has natural termite mounds within it, which many zoos in India do not have.

Arignar Anna Zoological Park, Vandalur, Chennai. Tamil Nadu

The Arignar Anna Zoo is known for its various animal exhibit designs and its size. The zoo always is being tried upon to add new and innovative ideas, but some could get implemented and rest are underway. The zoo also has a very strong administration and technical manpower including biologists and veterinary officer.

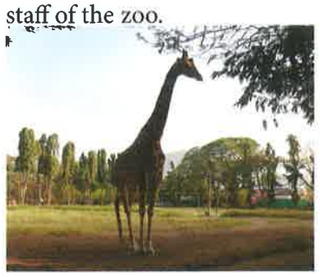
Tiger

The zoo has many of the exhibits with huge naturalistic moat which is beyond the prescribed dimensions of those of CZA. The exhibit for Royal Bengal tiger is one of them. The visitors see them

as they see the tigers in the wild. The tigers have been breeding successfully in the zoo. Though the enclosure is being criticised upon as it is placed opposite to the herbivore enclosure, it is one of the finest exhibit of prey-predator type, as visitors see both the species of animal.

Sri Chamarajendra Zoological Gardens, Mysore, Karnataka

Though this zoo is known for its breeding activity of many exotic species and its rich collection since its inception, the zoo has many outstanding exhibits for the native species and identified as a part of the ongoing conservation breeding programme for the Lion-tailed macaque and Nilgiri langur. As the zoo is quite close to the range areas of both the species in the Western Ghats, it has kept good breeding records too. This is also due to its great exhibits as well as dedicated officers and staff of the zoo.



Giraffe

The Giraffe exhibit perfectly matches with theanimal requirement and its lush green vegetation as in the background.

Lion-tailed macaque

The Lion-tailed macaque exhibit at this zoo has all features required for the animals, including to meet their locomotory behaviour. The exhibit has a place for hiding while the dominant males become aggressive. It also has several wooden logs, rocks, shrubs. The enclosure is fully enriched to keep the animals active.

Total area provided in the paddock	Depth of the enclosure
5090 Sqmt	45-102 sqmt

Padmaja Naidu Himalayan Zoological Park, Darjeeling, West Bengal

The zoo is known for the specialized animal collection plan, which none of the zoos in the country has. In spite of zoo is located in High Altitude, it attracts more tourists from India and abroad.

The zoo has set very high standards in housekeeping of animals. The CZA has assigned the zoo as Coordinator for various species for the Conservation Breeding Programme. The species includes are Red panda, Snow leopard, Tibetan wolf, Himalayan salamander and many more. The zoo also has many international exchange programme, infusing new bloodline into their stock, thereby the highest degree success in their conservation breeding programme. The zoo is also carried out a success story of releasing two captive bred Red panda into its wild habitat, of which one died due to leopard attack however, the another Red panda mated with a wild Red panda and gave birth in the wild. The whole episode was recorded and it has been published too.

Red panda

The Red panda exhibit is an open, naturalistic and fully enriched exhibit with great breeding success. The exhibit has provided with elevated platforms made using natural material. It also has natural box type structures for hiding or in adverse climatic conditions, the animals also use them. The exhibit has depth on lesser side. However, it has not affected any breeding. The visitors enjoy them seeing at close watch.

Total area provided in the paddock	Depth of the enclosure
600 Sqmt	6 mts

Snow leopard

Total area provided in the paddock	Depth of the enclosure
900 Sqmt	7 mts

Snow leopards are housed in pairs. The exhibit has oriented in a way to provide multiple activity to the animals and kill their boredom. Though the area is just enough for them, the zoo is planning for another independent breeding centre at Dow Hill. The present exhibit is of covered type enclosure with rocks, natural floor, elevated areas for animal to rest. Good amount of natural endemic vegetation present.

Aviary for Pheasants

The zoo has beautiful aviaries for pheasants with glass fronted for uninterrupted viewing. Though on sides and top, it is covered by using chain link fence, the aviary has been provided sufficient amount of the depth as withdraw-

al area to get good breeding records. The exhibit can be seen full of vegetation, multiple natural perches and feeding troughs. These aviaries are located in a way that they get full sun light, which is very important for all birds.

Chidiyatapu Biological Park, Andaman & Nicobar Islands

The Mini Zoo at Haddo, a zoo earlier de-recognized by the CZA, is being relocated to the new site at Chidiyatapu. The present site is moist deciduous forest close to the sea. The zoo is planned to house only endemic fauna like Andaman wild pigs, Crab-eating macaque, Sea eagle, Estuarine Crocodile and others. The vegetation is so thick in many places in the zoo, that sun light does not reach the ground. The site is intact of forest tract, the layout and initial design done by late Shri Pushp Kumar. The construction at the zoo is carried out in such a way not a single inch of the land is being disturbed. Everything looks part of their habitat. The zoo has also provided a good number of visitor areas, located at elevated place which provides a good view to see as well as place for the visitors to relax and enjoy the nature and do bird watching.

Aizwal Zoological Parl, Aizwal, Mizoram

Binturong

A small category zoo is spread on 65 hectares, breeding many endangered species from the North East, including Hoolock gibbon, Pig-tailed Monkey, Stump Tailed Monkey, Serow, Hume's Pheasants and Binturongs.

The exhibit for Binturong provides tall trees where the animals spend 90% of their time. The visitors see them as if they are in the wild. These animals are being bred in the zoo very successfully. The animals are rarely seen on the ground. The exhibit meets animal's most biological requirements.

Sanjay Gandhi Biological Park, Patna, Bihar

Total area provided in the paddock	Depth of the enclosure
2100 Sqm	20 m

One-horned Rhinocerous

The Sanjay Gandhi Biological Park has a record breeding of one-horned rhinoceros at the zoo. The zoo exhibit with a large water body and good vegetation, and its animals housed are well planned, which allows zoo to separate male and female and mix them as and when required.

Maitri Baagh Zoo, Bhilai, Jharkhand

Pelican's Aviary

Though the zoo is in the stage of de novo for many exhibits, however, with limited area availability with the zoo, the zoo has been very successful in breeding the Rosy pelicans. The birds are found very healthy since the provided atmosphere is quite balanced and one could see the feather coat of these birds as seen in case of the wild birds. All these birds live in harmony. The water provided in the pool is checked by the zoo staff from time to time. The breeding of pelican makes them proud.

Thiruvananthapuram Zoo, Thiruvananthapuram, Kerala

Sloth bear

The Zoo's Sloth bear exhibit has been provided natural setting. This provides them to meet their burrowing habit and exploratory behaviour.

Total area provided in the paddock	Depth of the enclosure	No of feeding retiring cells available
715 Sqm	Five m	four

Nandankanan Biological Park, Bhubaneshewar, Odisha

Hippopotamus

The hippopotamus exhibit at the zoo is world class and has no competitor. It is the largest among the hippopotamous exhibits anywhere. The visitors can see 8-10 nos. of Hippopotamous at a time.

The water never smells, since the water body is attached to an adjacent lake, all wastes are flown from exhibit to lake area. It has huge sand bank and large trees to provide shade to the animals.

Gharial

The zoo is known for Gharial and Crocodile breeding from early 1970s. The exhibit looks as if you are watching them in large river. The water is always clean, it has its natural filtration system too. The sandy banks provide animals to bask and lay eggs. The green cover surrounding the exhibit provides a good buffer around the exhibit.

Conclusion

The 21st Century conservation efforts will preserve habitats in varying degree of fragmentation and wildlife conservationists will need to be creative with broken systems. Species survival will emerge as a clear separate agenda from habitat preservation, a global experiment in biospheric rescue where the line between nature and captivity will be blurred. Today, when wildlife habitats are under severe pressure and a large number of species of wild fauna have become endangered, the Zoos are not only to sustain the population of such species but also augment the depleting populations of endangered species in the wild. This new role for the Zoo has also been acknowledged by the global conservation community. After making immense efforts, the conservation breeding of identified endangered species has just began. But the exhibits need planning and design in such a way that they meet the biological requirement of the animals housed therein. The objective of keeping animals merely for entertainment is changed. It is high time that to bring about a holistic development of Zoos in India and achieve the main objective of Zoos as Centers that complement the national effort of wildlife conservation in India. For this, we need to infuse more technical and scientific culture in the operations of our Zoos by changing earlier perception of Zoos being mere picnic spots to scientific institutions.

A visit to Laboratory for Coservation for Endangered Species (LaCONES), at Center for Cellular and Molecular Biology (CCMB) with Dr Umapati, Senior Scientist, LaCONES

Jon Coe presenting

Audience at Technical Session -1

Day 2 - November 3, 2011

Technical Session 3

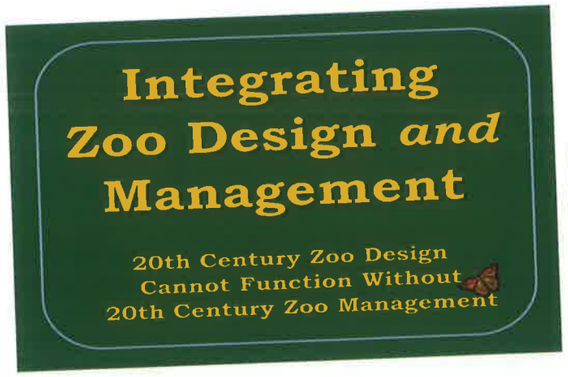
Animals' and keepers' perspective with facility design

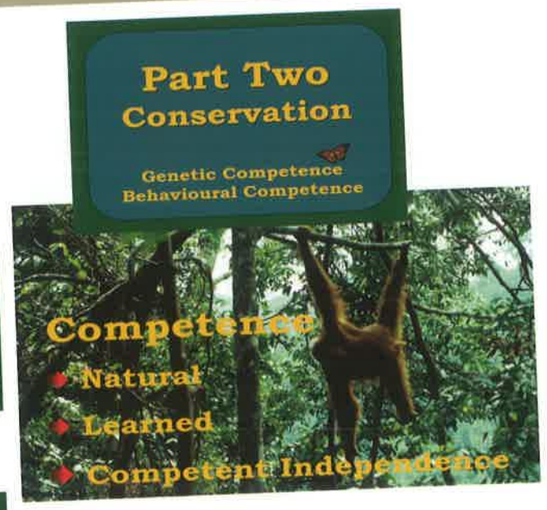
Speaker : Mr. Jon Coe, Australia

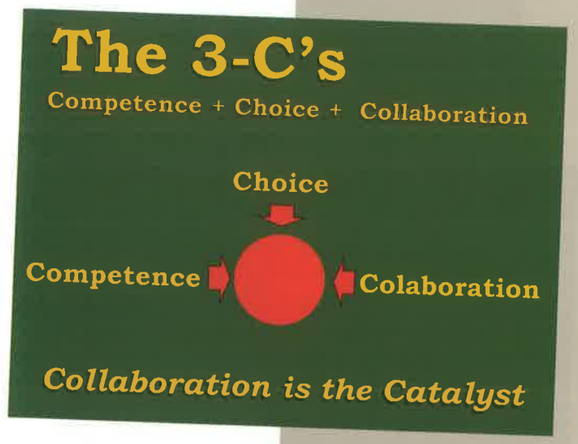
Mr. Jon Coe explained in his presentation "Animals' and keepers' perspective with facility design", the built in features of enduring interest to animals, animal health, freedom, animal breed in the zoo have the same competence. He also explained about keepers' safety and emphasised on integrated environmental enrichment and rescue operations & reintroduction of animals, long term breeding programmes, etc.

Animals' and Keepers' perspective with Facility Design

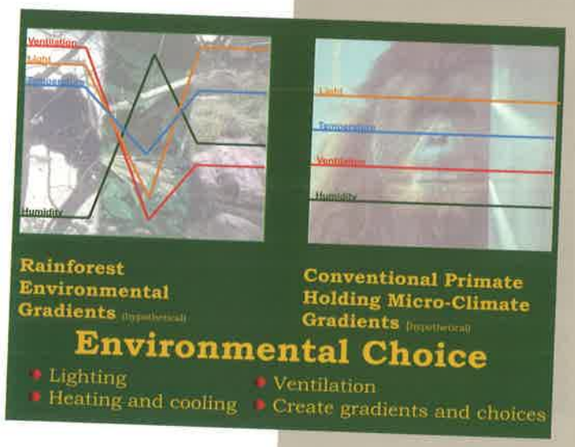
- by Jon Coe

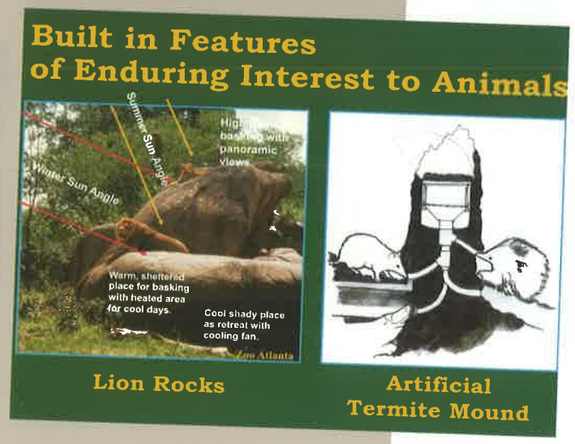


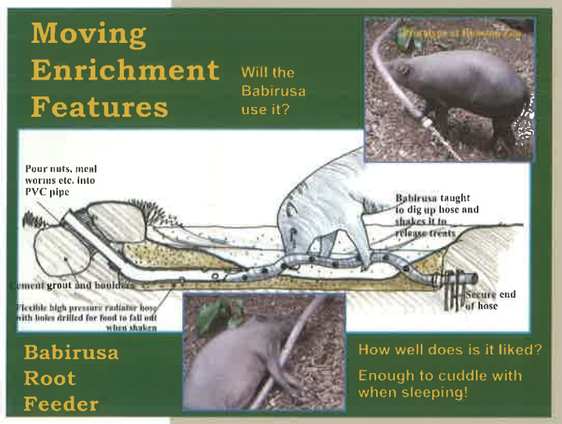



The 3-C's
Competence + Choice + Collaboration
Choice
Competence
Colaboration
Collaboration is the Catalyst

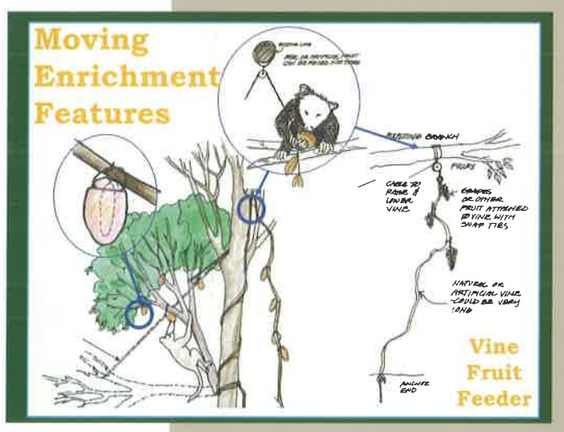

Environmental Enrichment
Interactive Enrichment Features

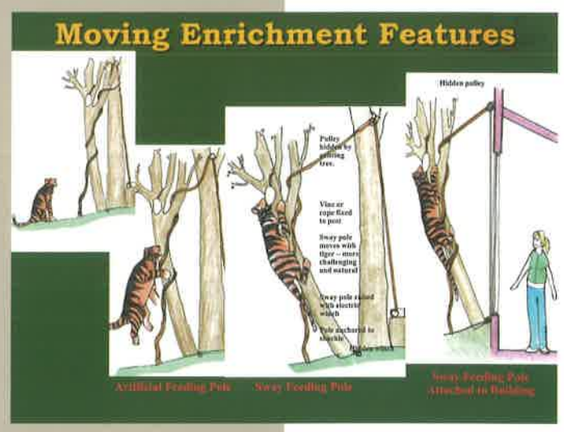

Ventilation
Light
Temperature
Humidity
Rainforest Environmental Gradients (hypothetical)
Conventional Primate Holding Micro-Climate Gradients (hypothetical)
Environmental Choice
Lighting
Heating and cooling
Ventilation
Create gradients and choices

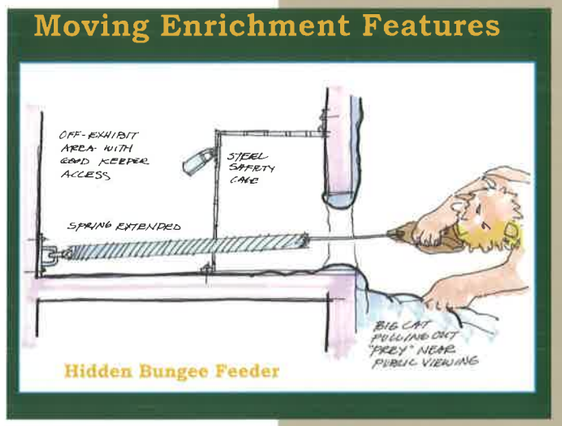

Built in Features of Enduring Interest to Animals
Summer Sun Angle
Winter Sun Angle
Warm, sheltered place for basking with heated area for cool days.
Cool shady place as retreat with cooling fan.
Lion Rocks
Artificial Termite Mound

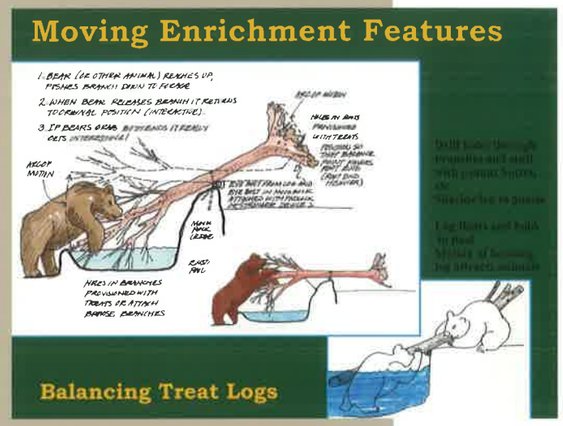

Moving Enrichment Features
Will the Babirusa use it?
Pour nuts, meal worms etc. into PVC pipe
Babirusa taught to dig up hose and shakes it to release treats
Secure end of hose
Flexible high pressure radiator hose with holes drilled for food to fall out when shaken
How well does is it liked?
Enough to cuddle with when sleeping!
Babirusa Root Feeder

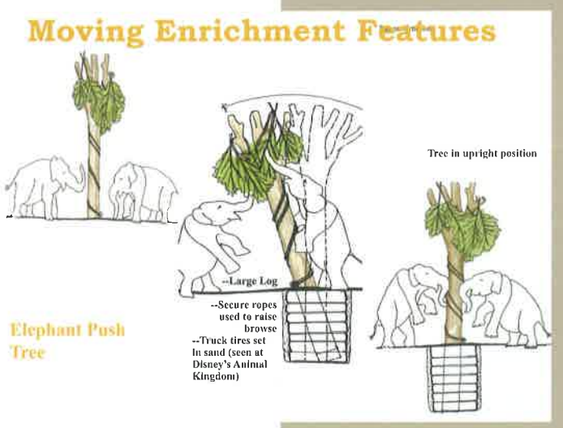

Moving Enrichment Features
Testing Artificial Tree Limb
Denver Zoo
Sway Branch Concept

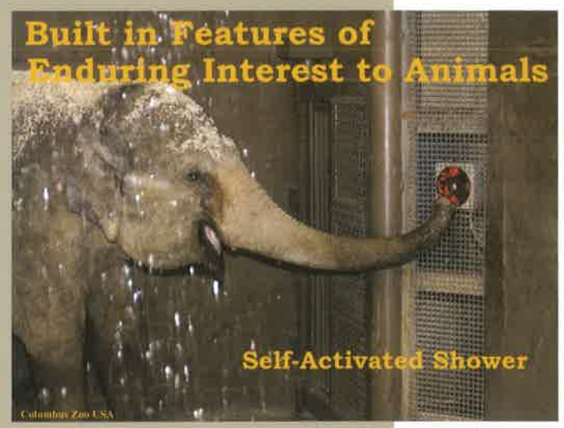

Moving Enrichment Features
Vine Fruit Feeder


Moving Enrichment Features
Hidden pulley
Artificial Feeding Pole
Sway Feeding Pole
Sway Feeding Pole Attached to Building

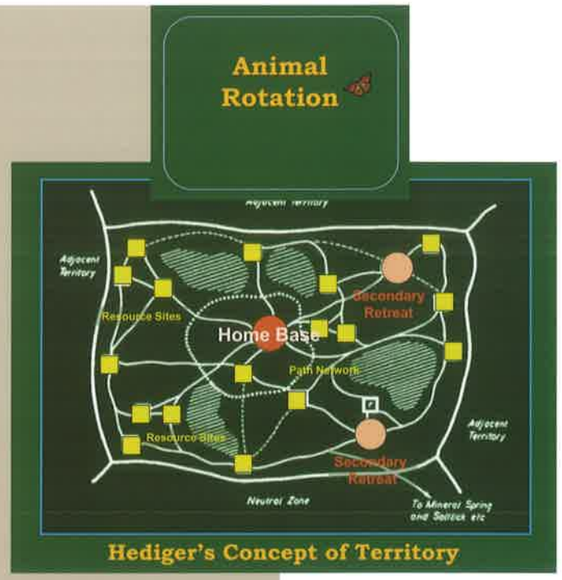

Moving Enrichment Features
OFF-EXHIBIT AREA WITH GOOD KEEPER ACCESS
STEEL SAFETY CAGE
SPRING EXTENDED
BIG CAT PULLING OUT "PREY" NEAR PUBLIC VIEWING
Hidden Bungee Feeder


Moving Enrichment Features
1. BEAR (OR OTHER ANIMAL) REACHES UP, PUSHES BRANCH DOWN TO FENCE
2. WHEN BEAR RELEASES BRANCH IT RETURNS TO ORIGINAL POSITION (INTERACTIVE).
3. IF BEARS GRAB BRANCH IT REMAINS OUT OF REACH
RELEASE WITHIN
MAIN HAUL LEAD
EXIST TREE
HOLES IN BRANCHES PROVIDED WITH TREATS TO ATTACH BARREL BRANCHES
Balancing Treat Logs


Moving Enrichment Features
Tree in upright position
--Large Log
--Secure ropes used to raise browse
--Truck tires set In sand (seen at Disney's Animal Kingdom)
Elephant Push Tree


Built in Features of Enduring Interest to Animals
Self-Activated Shower
Columbus Zoo USA

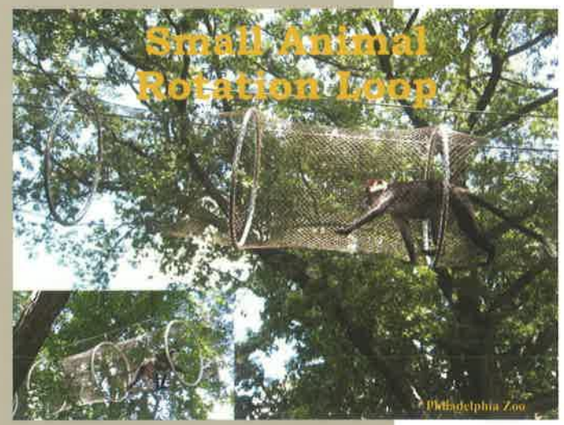

Integrated Environmental Enrichment
Use everything in Off-Exhibit Areas
Denver Zoo

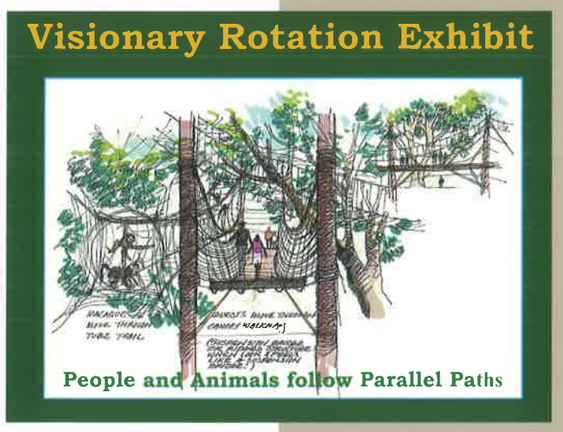

Animal Rotation
Adjacent Territory
Resource Sites
Home Base
Secondary Retreat
Path Network
Resource Sites
Secondary Retreat
Adjacent Territory
Neutral Zone
To Mineral Spring and Saltlick etc
Hediger's Concept of Territory


SERVICE
EXHIBIT 4.
EXHIBIT 3.
EXHIBIT 2.
EXHIBIT 1.
Great Ape Rotation: Zoo Atlanta

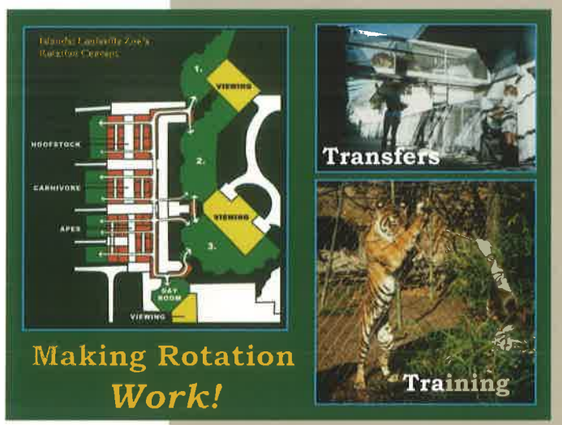

Sanctuary Rotation

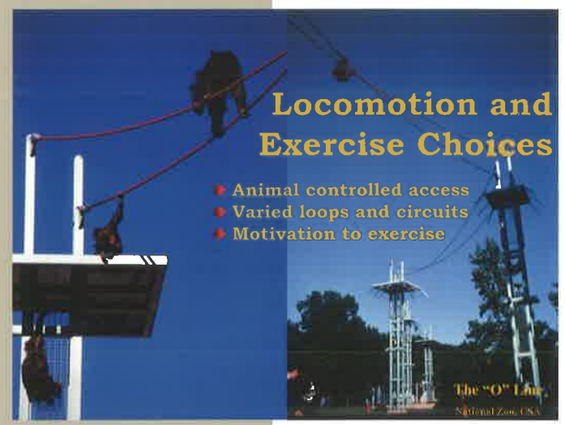

Small Animal
Rotation Loop
Philadelphia Zoo


Small Animal
Rotation Loop
Philadelphia Zoo


Visionary Rotation Exhibit
People and Animals follow Parallel Paths


Multi-Species Rotation
Louisville Zoo, USA


Making Rotation
Work!
Transfers
Training

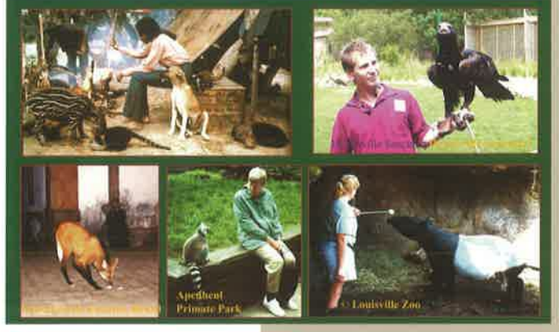

Locomotion and
Exercise Choices
Animal controlled access
Varied loops and circuits
Motivation to exercise


Free-ranging Orangutans
Keeper is present at all times
Hidden flat wires prevent young
apes from climbing down

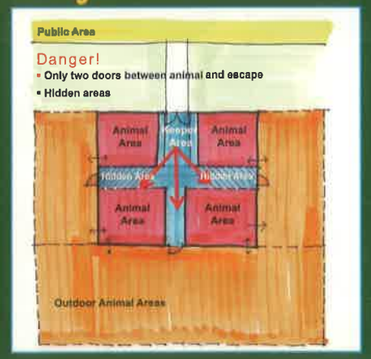

Elephant Crossing

Part Three
Operations

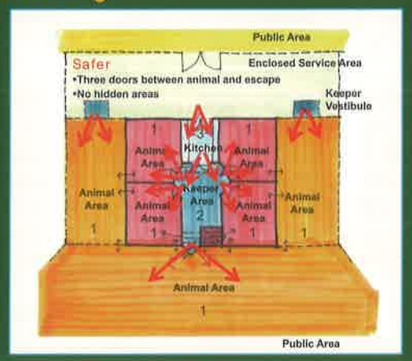
Positive Training



Security

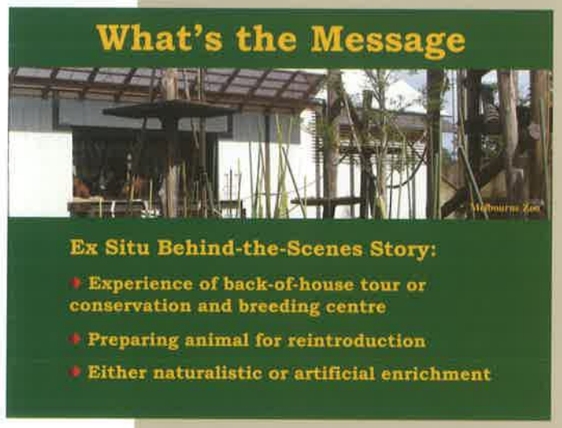


Security

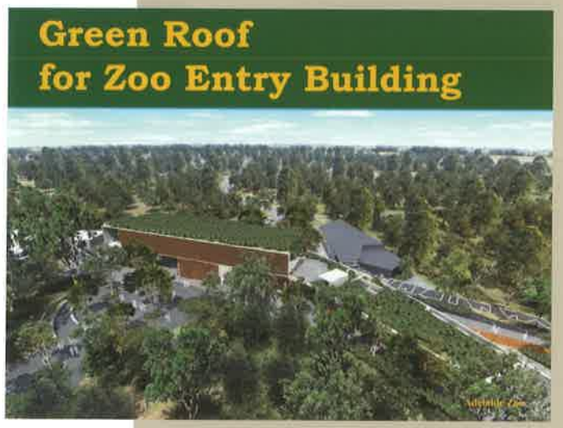


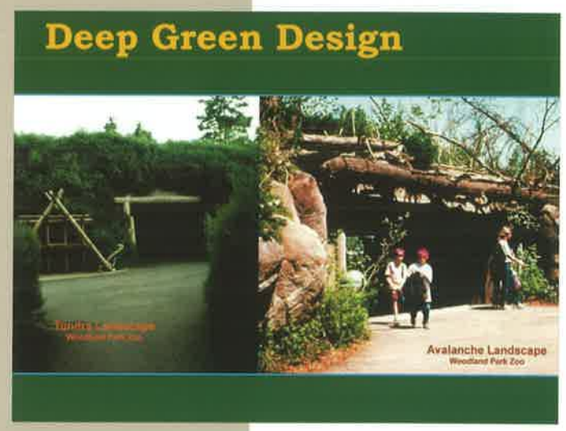
Blood Draw Sleeves

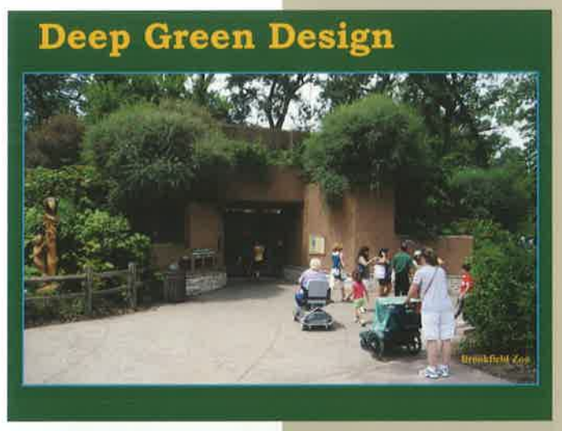
Animal is trained to hold paw in sleeve to receive injection or blood draw


What's the Message
Ex Situ Behind-the-Scenes Story:
Experience of back-of-house tour or conservation and breeding centre
Preparing animal for reintroduction
Either naturalistic or artificial enrichment

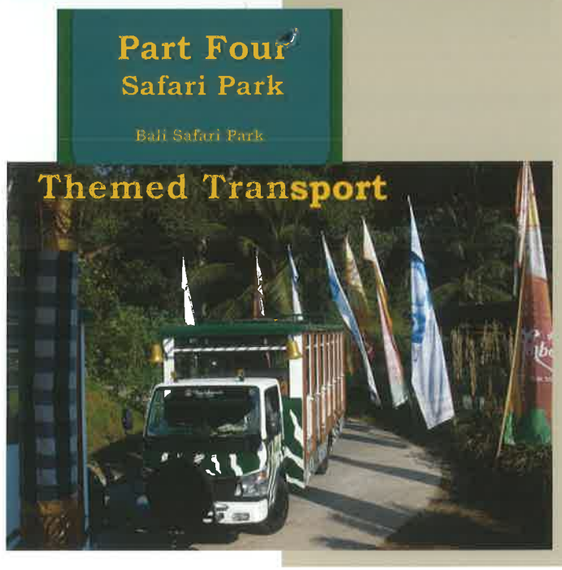

Green Design


Green Roof
for Zoo Entry Building


Deep Green Design
Avalanche Landscape
Woodland Park Zoo

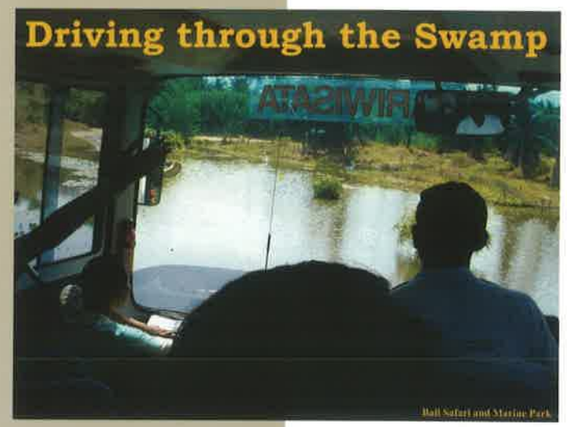

Deep Green Design


Sustainable
Engineering Systems


Part Four
Safari Park
Bali Safari Park
Themed Transport


Stations

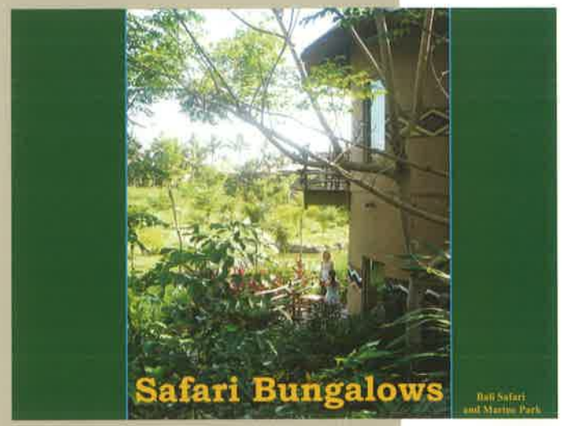

Driving through the Swamp
Sumatran Island
Gibbon Islands
Submerged Road
Water moat
Bali Safari and Marine Park

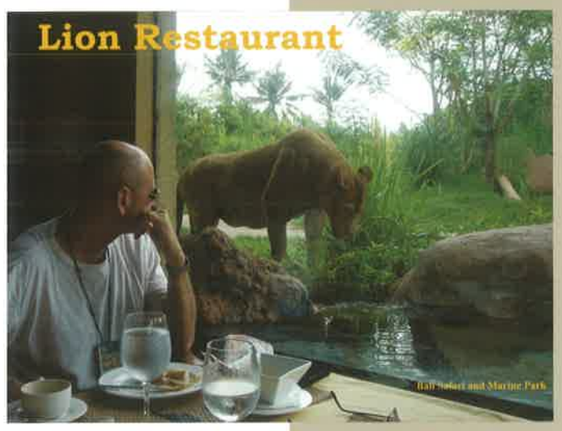

Driving through the Swamp
Bali Safari and Marine Park


Driving through Hippo Pool
Bali Safari and Marine Park


Drive through Tiger Exhibit
Bali Safari and Marine Park


Safari Bungalows
Bali Safari and Marine Park

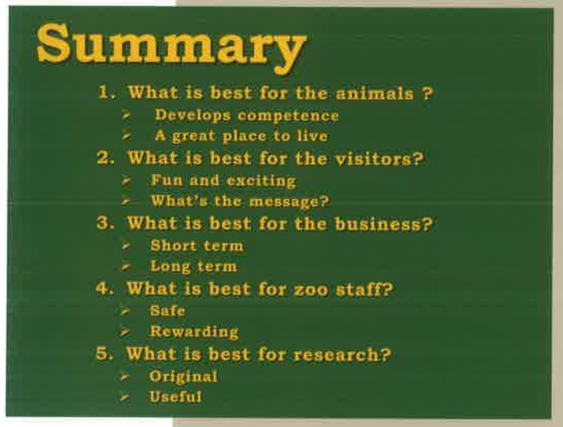

Safari Bungalows
Bali Safari
and Marine Park

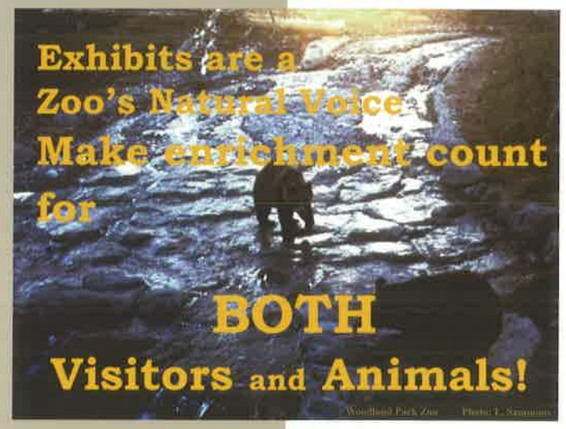

Lion Restaurant
Bali Safari and Marine Park


Lion Restaurant


Bali Safari and Marine Park

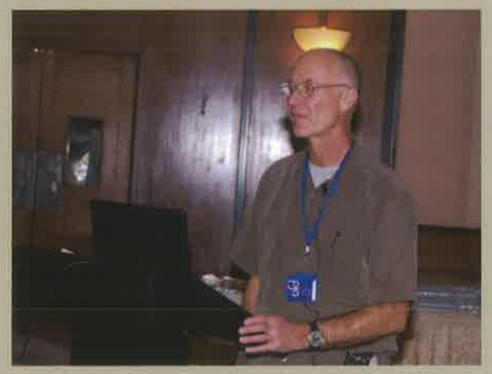

Collaboration
Enrichment
Conditioning
Specialists
Senior
Managers
Designer
Operations
Care
Givers
Educators
Security
Veterinarians
A Seat at the Table


Summary
1. What is best for the animals ?
Develops competence
A great place to live
2. What is best for the visitors?
Fun and exciting
What's the message?
3. What is best for the business?
Short term
Long term
4. What is best for zoo staff?
Safe
Rewarding
5. What is best for research?
Original
Useful


Exhibits are a
Zoo's Natural Voice
Make enrichment count
for
BOTH
Visitors and Animals!

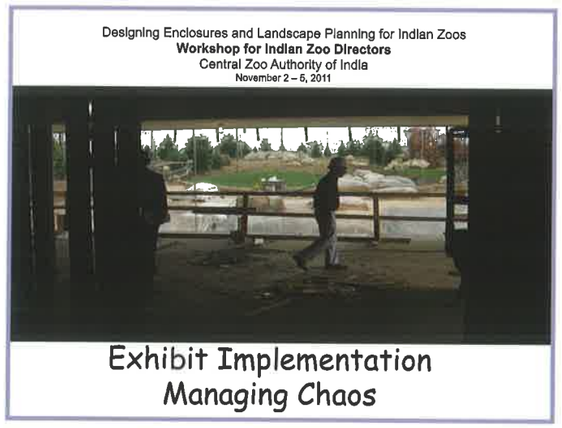

Questions?

Zoo Exhibit Implementation: Managing Chaos
Speaker : Mr. Roger Shermon, PJA Architects, USA



The presentation "Zoo Exhibit Implementation: Managing Chaos" by Mr. Roger Shermon explained about the implementation of zoo exhibit designs and goals with importance of planning & design. He alsoshared his experiences and focussed on case studies of cheetah exhibit, Amur tiger, and polar frontier.

Zoo Exhibit Implementation: Managing Chaos
- by Roger Shermon



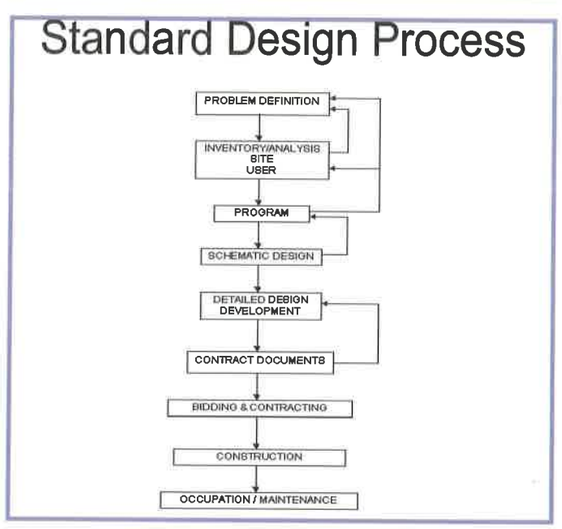
This presentation is about implementation of zoo exhibit designs.
The Goals:

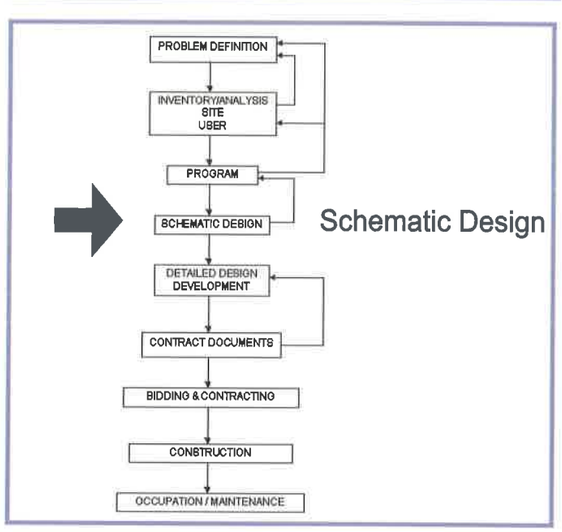
To teach zoo directors about the importance of planning and design.

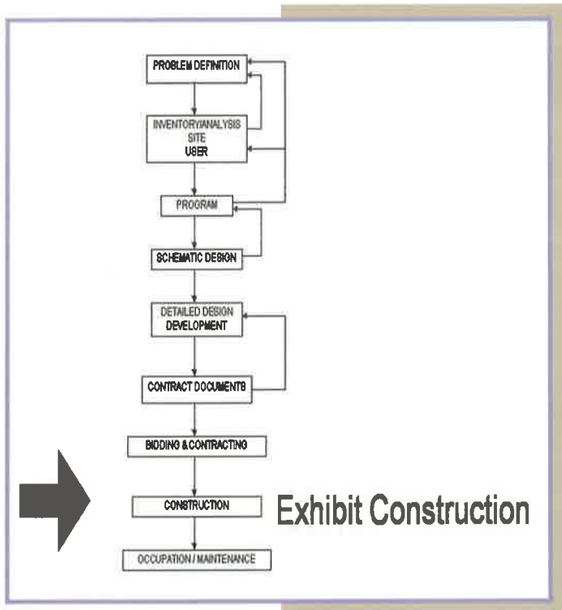
To learn how to translate that planning and design into something tangible.

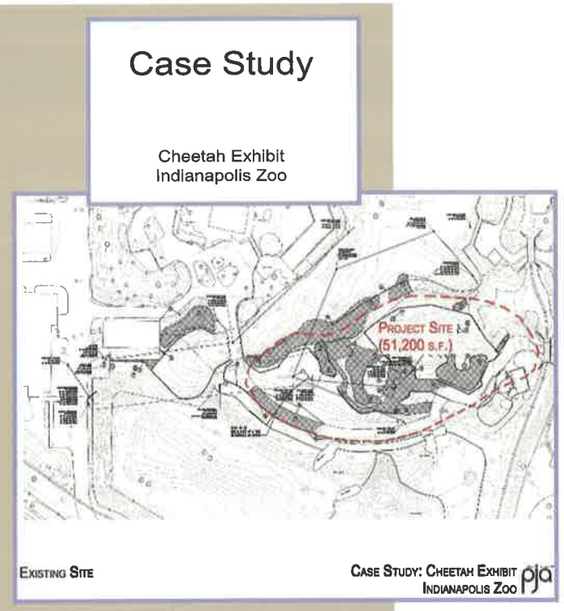
To learn about tools to manage the process.

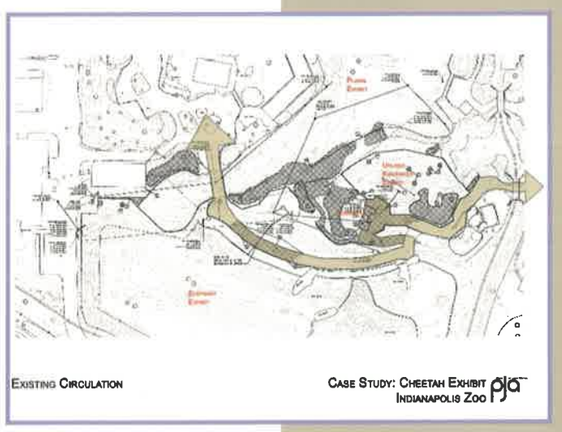
To build a zoo design vocabulary.

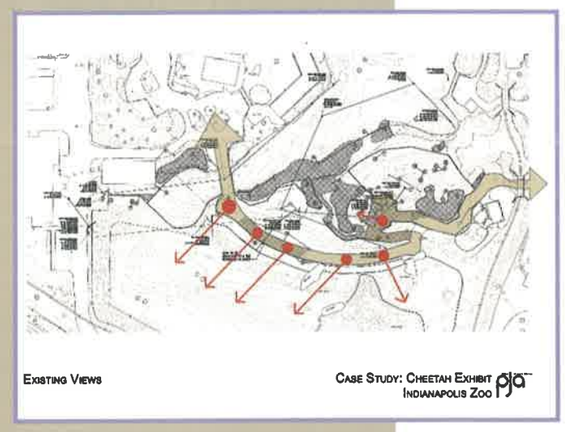


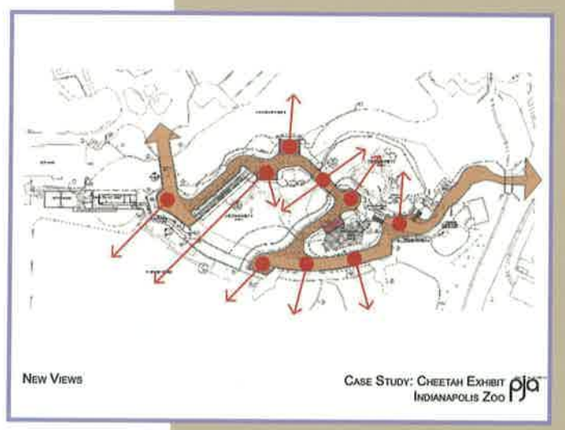


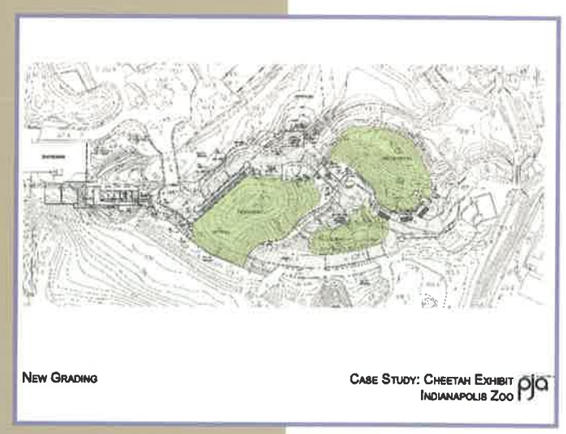

PROBLEM DEFINITION
INVENTORY/ANALYSIS
SITE
USER
PROGRAM
SCHEMATIC DESIGN
DETAILED DESIGN
DEVELOPMENT
CONTRACT DOCUMENTS
BIDDING & CONTRACTING
CONSTRUCTION
OCCUPATION / MAINTENANCE
Exhibit Construction

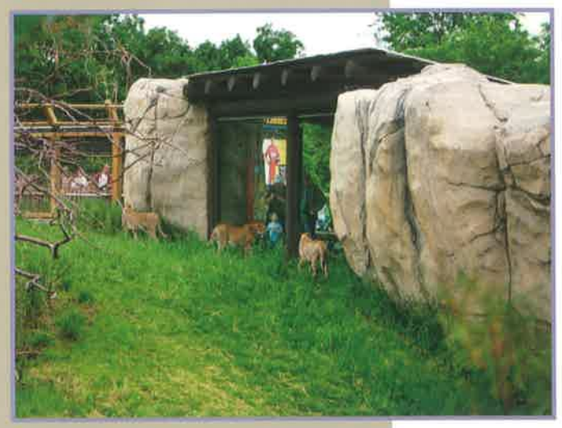

Case Study
Cheetah Exhibit
Indianapolis Zoo
PROJECT SITE
(51,200 S.F.)
EXISTING SITE
CASE STUDY: CHEETAH EXHIBIT
INDIANAPOLIS ZOO
pja

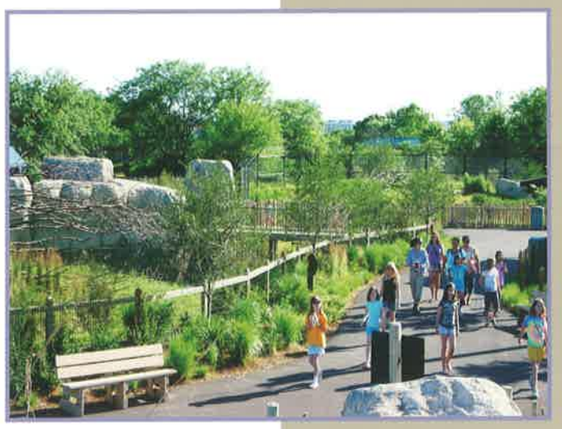

EXISTING CIRCULATION
CASE STUDY: CHEETAH EXHIBIT
INDIANAPOLIS ZOO
pja

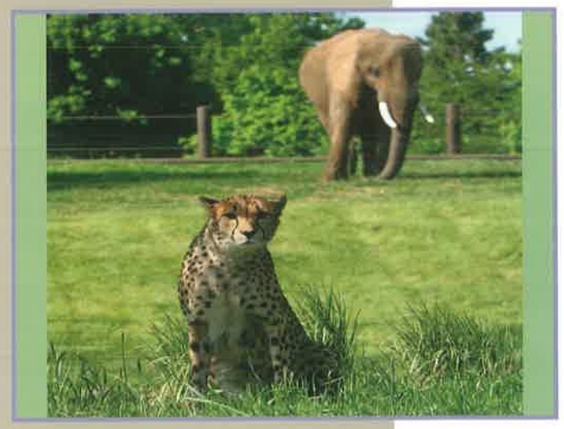

EXISTING VIEWS
CASE STUDY: CHEETAH EXHIBIT
INDIANAPOLIS ZOO
pja


New Views
Case Study: Cheetah Exhibit
Indianapolis Zoo
pja


New Grading
Case Study: Cheetah Exhibit
Indianapolis Zoo
pja

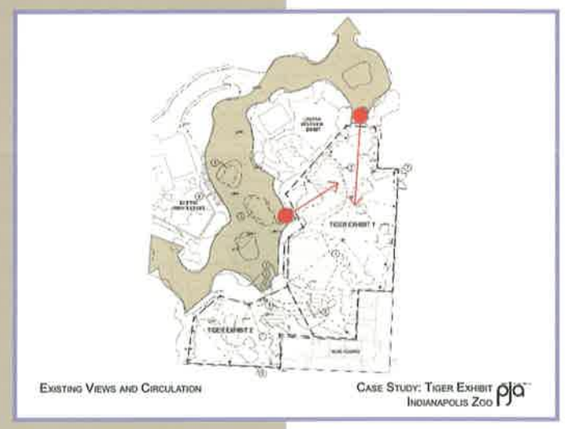


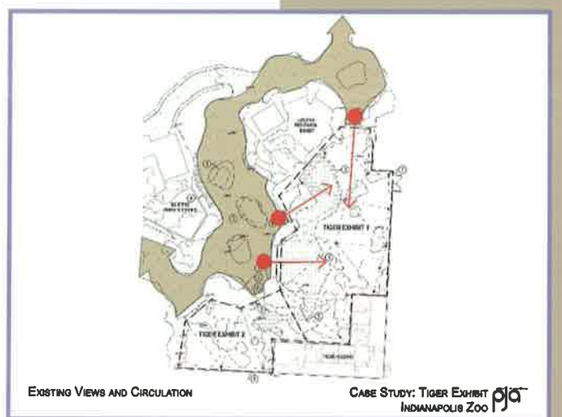


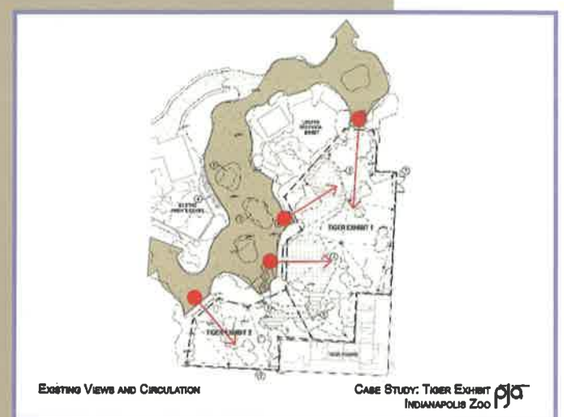


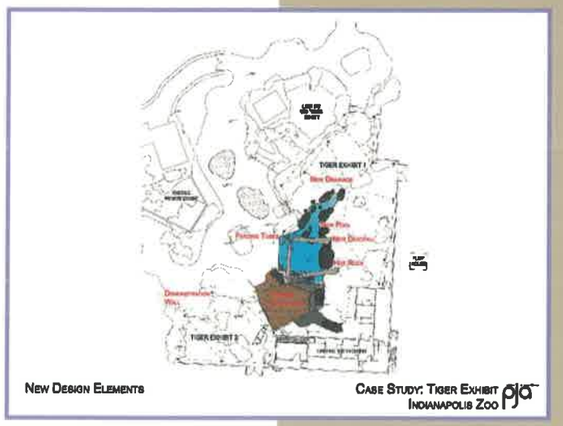
Case Study

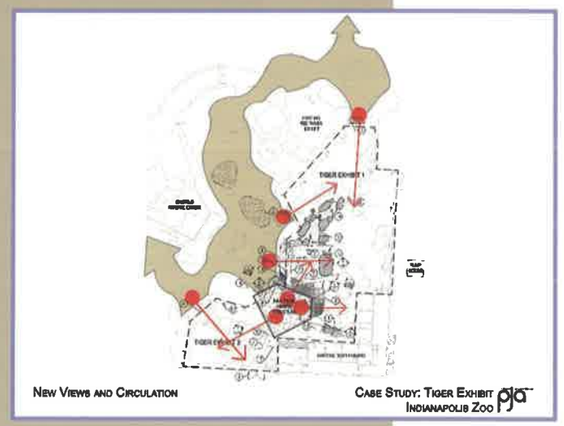
Amur Tiger Exhibit
Indianapolis Zoo



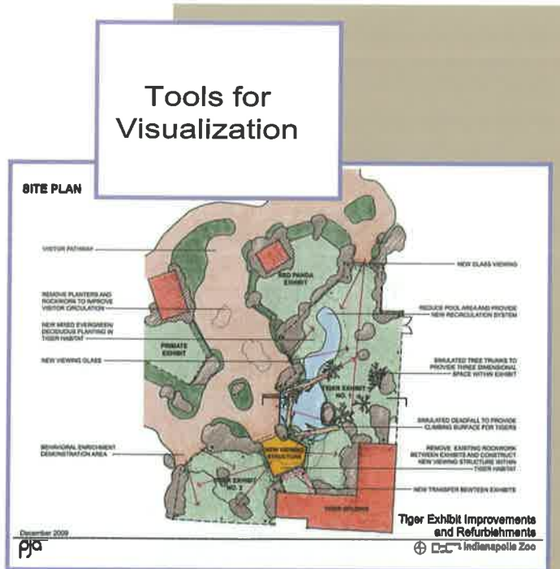

Existing Views and Circulation
Case Study: Tiger Exhibit
Indianapolis Zoo
pja

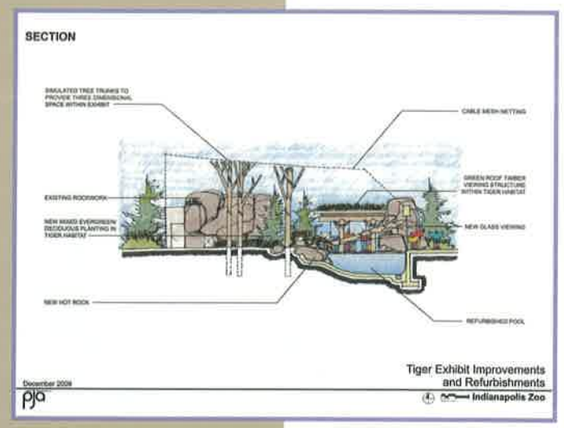

Existing Views and Circulation
Case Study: Tiger Exhibit
Indianapolis Zoo
pja

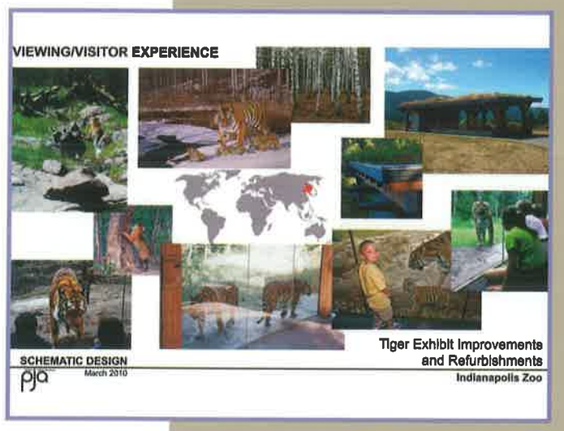

New Design Elements
Case Study: Tiger Exhibit
Indianapolis Zoo
pja

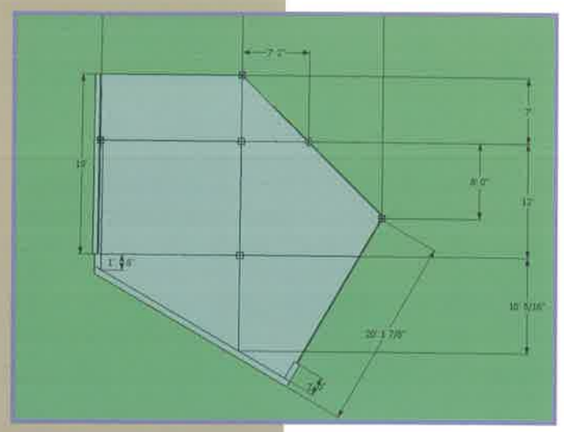

New Views and Circulation
Case Study: Tiger Exhibit
Indianapolis Zoo
pja

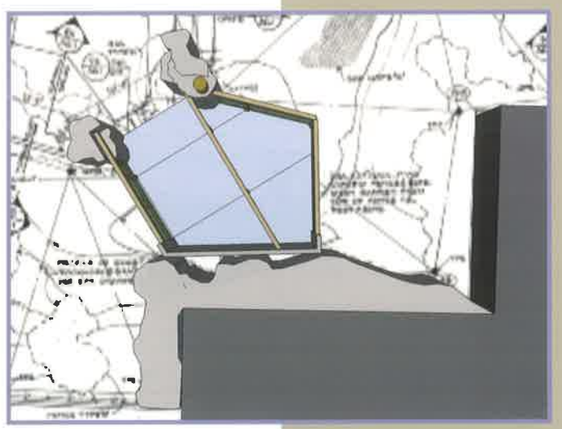
Tools for Visualization

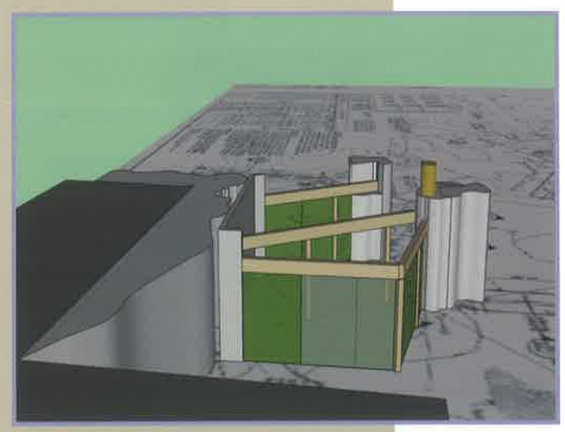


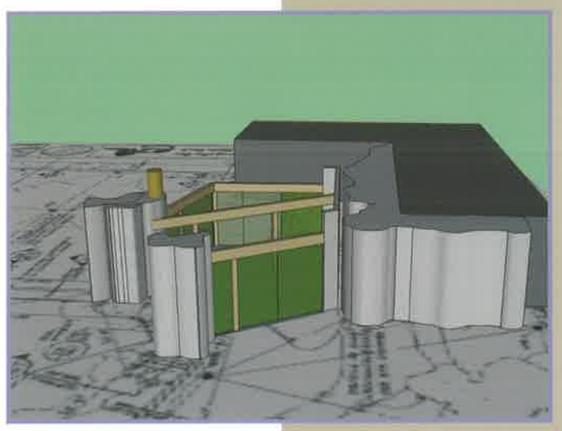


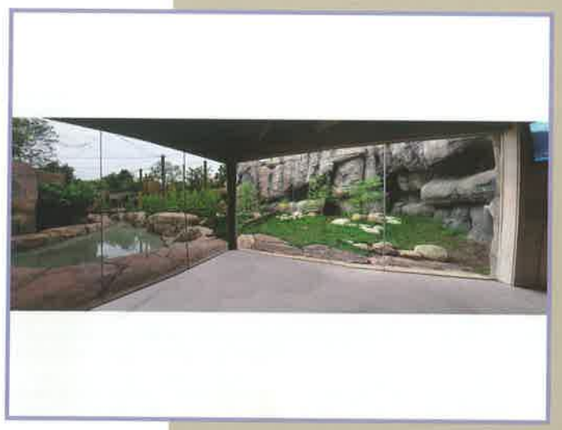


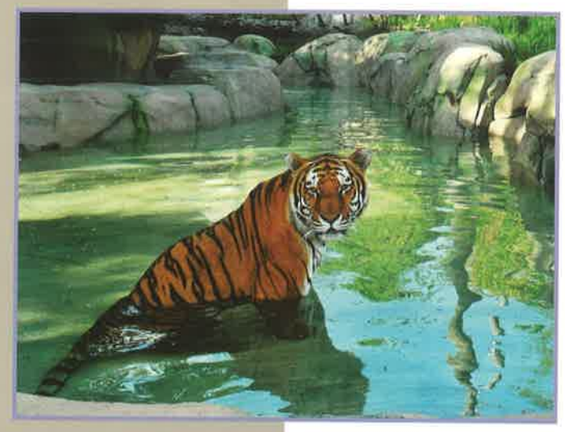


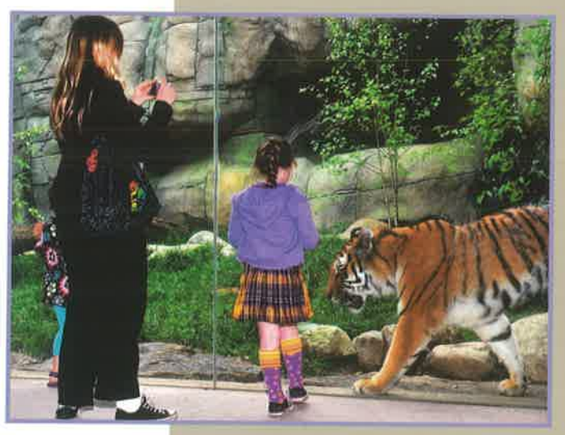












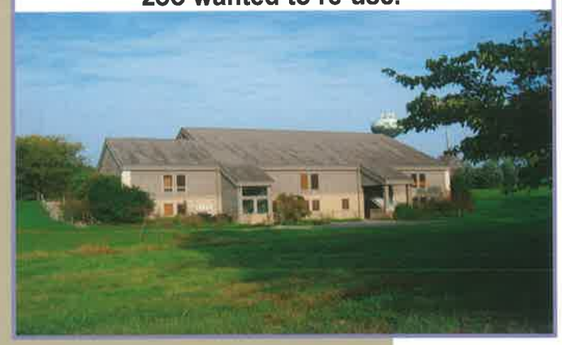
Case Study

Polar Frontier
Columbus Zoo

Existing Site

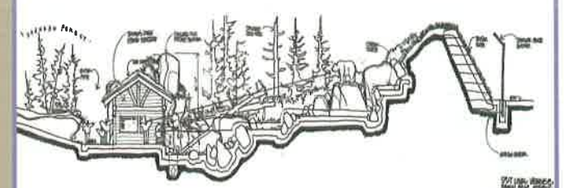
Tools for Visualization

Site includes an old church that the zoo wanted to re-use.



Final Schematic Plan

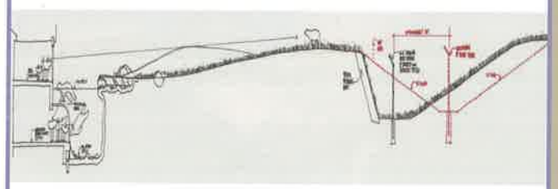
Brown Bear Schematic Section



Polar Bear Schematic Section

Constant tweaking to reduce cost

Grading is one of those design components that is poorly understood by architects, civil engineers, and zoo staff. Even landscape architects that are not familiar with zoo design.



Scale Models to help everyone understand the site.

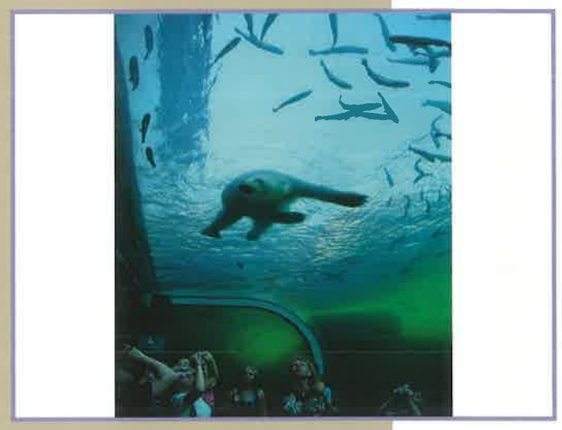
Testing Life Support Systems

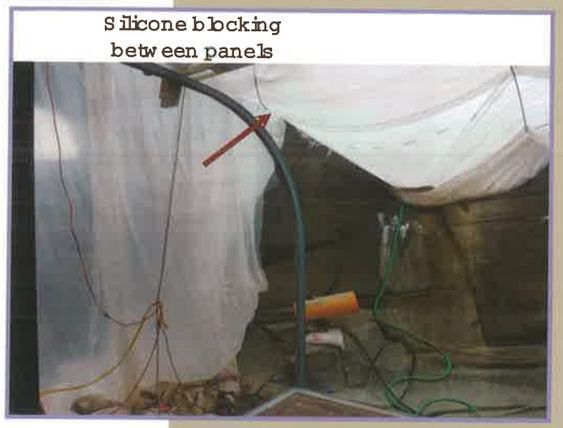

Testing design assumptions.

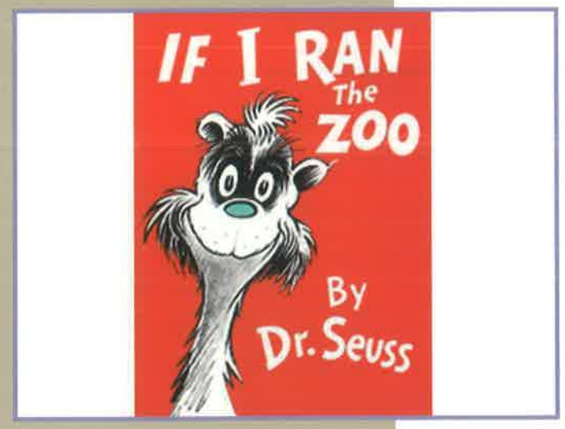

Testing Door Operation Systems

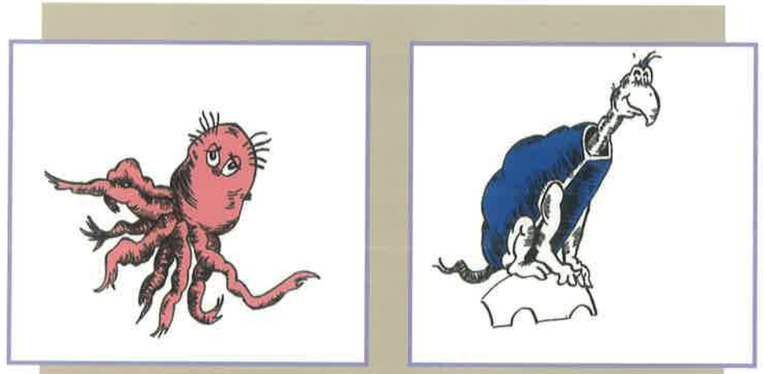

Is that drain at the low point?


When technical problems arise...




Silicone blocking
between panels


IF I RAN
The
ZOO
By
Dr. Seuss



"It's a pretty good zoo,"
Said young Gerald McGrew,
"And the fellow who runs it
Seems proud of it, too."

"But if I ran the zoo,"
Said young Gerald McGrew,
"I'd make a few changes.
That's just what I'd do..."

"How do you build a better zoo?
Could you outdo McGrew?"

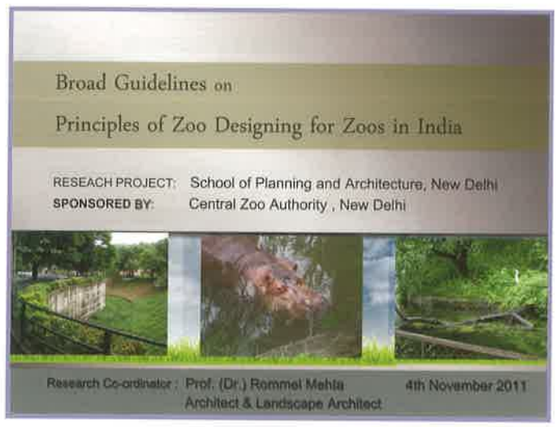
Thank You.

Broad guidelines on planning and architecture
Speaker : Prof. Rommel Mehta, SPA

Prof. Rommel Mehta explained that while any enclosure is designed, all the stake holders that is animals, keepers and visitors are to be taken into account. In his presentation "Broad guidelines on planning and architecture", he mainly focused on categorization of zoos for design and explained about the guidelines and principles of zoo designing.

Broad Guidelines on Planning and Architecture

- by Rommel Mehta



INTRODUCTION

Zoos in India

In my association with zoos over the few years it was observed that .

There are no available inclusive Design Guidelines

For comprehensive design and development

of Zoos in India

INTRODUCTION

Zoos in India

There is a vision resulting in some kind of visualization in the mind of the zoo director (refer him as the client)

But

That vision has to be communicated, discussed and got executed

But this is not easy

Zoo is not a single entity

INTRODUCTION

Zoos in India

Zoo is not only animals

Zoo is not only visitors

Zoo is not only enclosures

Zoo is not only barriers

Zoo is not anything in isolation

Zoo is a complex amalgam of environment and design

Of natural & man made entities

In a dynamic balance

INTRODUCTION

Zoos in India

Herein lies the complexity of providing

Design Guidelines

And herein lies the necessity

INTRODUCTION

Zoos in India

With such numerous variables of

climate, topography, forest types, geological & hydrological regimes, animals, birds

Add

The varied backgrounds, experiences, knowledge levels, vested interests of all concerned with the zoo design along with local social and political scenarios

INTRODUCTION

Zoos in India

The result is a zoo design which can still be improved !

(if it does not have to be redesigned)

Therefore the requirement of

Design Guidelines

INTRODUCTION

Zoos in India

To evolve design guidelines, categorization of zoos shall be different from categorization of zoos based on management or administrative requirements.

Categorization of Zoos for Design

CATEGORIZATION OF ZOOS FOR DESIGN

Zoos in India

Categorization on Administrative Basis

The present categorization being followed by the Central Zoo Authority is as follow:

- Large zoos
- Medium zoos
- Small zoos
- Mini zoos

CATEGORIZATION OF ZOOS FOR DESIGN

Zoos in India

To qualify to be classed under a particular category, the zoo should meet at least any of aforesaid four criteria, but including number of species and number of animals.

Category of Zoo	Criteria for qualifying to the category					
	Area of the zoo (hectares)	No. of visitors in a year (in lakh)	No. of species	No. of animals	No. of endangered species	No. of animals of endangered species
Large	75	7.5	75	750	20	100
Medium	35	3.5	35	350	10	50
Small	10	1.0	10	100	3	15
	Less than 10	Less than 1.00	Less than 10	Less than 100		

INTRODUCTION

Zoos in India

Zoos generally have large areas and dimensions

Therefore, it requires "landscape planning" as well as landscape/ architectural design.

Landscape planning covers macro environment of land used and planning activity dealing with landscape features, processes and systems.

Landscape and architectural design will mean design detail of smaller specific areas such as enclosures, barriers, public utilities, shelters, walls, steps etc.

INTRODUCTION

Zoos in India

As a result, the guidelines will fall under the following categories:

•Broad guidelines applicable for designing of **all zoos** in India

•Common guidelines applicable for designing of zoos in a identifiable **region** having common climatic and topographic characteristics.

INTRODUCTION

Zoos in India

Examples of

Broad guidelines applicable for designing of all zoos in India

•Maintain the existing surface drainage patterns.

•Existing vegetation should be retained and proposed planting should be selected from the forest type of the region.

•Access to the zoo should have a min. carriageway width of 7.5 mts

•Right of Way (ROW) should provide for a tree planting strip (1.5mts min.) and pedestrian path (2.0 mts min.)

•Signage (directional & otherwise) should begin from the entry area should be able to lead the visitor every where within the zoo, without help

INTRODUCTION

Zoos in India

Examples of

Guidelines applicable for a **region** having common climatic and topographic characteristics.

•Maintain the existing surface drainage patterns.

•Entry and gate design should conform to the expected no. of visitors.

•Maintenace regime should comnorm to the climate.

•Signage (directional & otherwise) should begin from the entry area should be able to lead the visitor every where within the zoo, without help

INTRODUCTION

Zoos in India

Examples of

Guidelines specific to the Zoo

•The entry gate should be recessed 12mts from the access road.

•Dense buffer planting of at least 3 rows of evergreen trees & shrubs should be done to separate the zoo and the sewage treatment plant.

•Wall should be built to separate the antelope enclosure from outside to prevent entry of feral dogs.

•All mature trees, (many over 60 yrs. old & spread of 16 mts) should be retained.

INTRODUCTION

Zoos in India

The categorization of zoos for purpose of establishing design guidelines should be based on

Major regional characteristics related to the geographical location

INTRODUCTION

Zoos in India

The location will determine :

Climate, Microclimate, Topography, Soils, Geology, Geomorphology, Surface hydrology and sub surface aquifer conditions, Forest type, Vegetation, Surface and infrastructural site influences, Views, and Noise levels

This will, in turn, relate to the kind of animals and birds inhabiting the region.

Zoos in India

The 'design' of zoos require a three stage approach:

INTRODUCTION

Zoos in India

The 'design' of zoos require a three stage approach:

Site Planning

Site planning, in relation to zoo design, is the process by which the requirements of the zoo are related to the site conditions. This is a very complex process best executed by a trained professional in consultation (not under instructions!) of others related with the project.

Layout and Design

Construction Details

INTRODUCTION

Zoos in India

The 'design' of zoos require a three stage approach:

Site Planning

Layout and Design

of enclosures and other structures including roads, paths and public sit out terraces etc..

Construction Details of each and every element. This includes architectural details, plumbing details, electrical details, mechanical equipment details, fabrication details, etc.

INTRODUCTION

Zoos in India

The 'design' of zoos require a three stage approach:

Site Planning

Layout and Design

Construction Details

of each and every element. This includes architectural details, plumbing details, electrical details, mechanical equipment details, fabrication details, etc.

INTRODUCTION

Zoos in India

It has been observed that while the intention and visualization may be apparent, but the necessary drawings and specifications stop far short of what is required by various contractors to execute the work to achieve the desired result.

The consequence is that this gap is covered by an assumption to follow what is existing or what has preceded. This has retarded innovation and use of latest materials, methods, fixtures, fabrication and construction methods now available in India.

CATEGORIZATION OF ZOOS FOR DESIGN

Zoos in India

Categorisation based on Site Planning & Design Considerations

The categorisation of zoos for purpose of establishing design guidelines should be based on major regional characteristic as a consequence of its the geographical location.

CATEGORIZATION OF ZOOS FOR DESIGN

Zoos in India

The location will determine the generic:

- Climate
- Microclimate
- Topography
- Soils
- Geology
- Geomorphology
- Surface hydrology and sub surface aquifer conditions
- Forest type
- Vegetation
- Site influences – surface and Intrastructural
- Views
- Noise levels

CATEGORIZATION OF ZOOS FOR DESIGN

Zoos in India

A broad locational classification of guidelines applicable to most zoos in a region will be of zoos in:

- Northern region
- Hilly areas with snow
- Hilly areas without snow
- Indo gangetic plain
- Central India
- Eastern hill region
- Western region
- Southern region
- Areas along the coast or open to marine influence

CATEGORIZATION OF ZOOS FOR DESIGN

Zoos in India

A comprehensive (but not limiting) list of factors which influence zoo design

1) Physical and Natural Considerations

A) Area

B) Location

i) Climate

ii) Topography

iii) Vegetation type and condition

iv) Geological and geomorphological condition

INTRODUCTION

Zoos in India

As a result, the guidelines will fall under the following categories:

- Broad guidelines applicable for designing of all zoos in India.
- Common guidelines applicable for designing of zoos in a identifiable region having common climatic and topographic characteristics.
- Specific guidelines for individual sites

Inspite of above no firm basis, which is non changing in space and time, exists or can probably be evolved.
Therefore the discretion, judgement, and wisdom of officer incharge still remains – but within the broad parameters of guideline and subject to veriable justification.

CATEGORIZATION OF ZOOS FOR DESIGN

Zoos in India

2) Administrative/ Use Aspects

a) Ownership
b) Administrative hierarchy
c) Number of visitors

3) Animal Related Considerations

a) Number of species of animals and birds on display
b) Method and authenticity of records
c) Record keeping
d) Veterinary facilities including records of health of animals, breeding programmes, and receipt/ exchange of animals
e) Breeding programmes – ex situ and conservation breeding

CATEGORIZATION OF ZOOS FOR DESIGN

Zoos in India

4) Visitors Related Considerations

a) Interpretation centre
b) Facilities for research
c) Programmes / facilities for education of public and collection plan related information, case histories, diet records etc.
d) Extension programmes
e) Safari parks
f) Facilities for amateur and professional photography and film making

CATEGORIZATION OF ZOOS FOR DESIGN

Zoos in India

4) Visitors Related Considerations

g) Special display – natural animals & birds, aquariums, reptile house, walk in aviary
h) Carcass disposal provisions
i) Security and protection of animals from bodily norm and pilferage
j) Prevention of vandalism
k) Security aspects of barriers on visitors and non viewing sides as well as security and law and order generally within the zoo premises
l) Method of display

INFORMATION, DRAWINGS & DOCUMENTS

Zoos in India

The base information, and drawings that are required for the three stages of design - Site planning, layout and design and construction details - is described below:

1. Address/ local area map
2. Land ownership records, including property description.
3. Deed conditions, restrictions, or covenants
4. Records of easements appurtenant
5. Public road frontage and property access information
6. Research into previous uses
7. Adjacent properties
8. Probable off – site easements required for road and utility construction
9. Location and proximity of major travel
10. Planning zoning and related development information

INFORMATION, DRAWINGS & DOCUMENTS

Zoos in India

11. Likelihood of citizen opposition and delays
12. Aircraft flight patterns and noise contours
13. Site topography
14. Soil information, including types and characteristics
15. Existing structures, paved areas, fences
16. Encroachments from structures on adjoining properties
17. Unusual on-site and adjacent and features
18. Existing roads
19. Earthquake potential, prevailing weather patterns

INFORMATION, DRAWINGS & DOCUMENTS

Zoos in India

Collection and Analysis of data

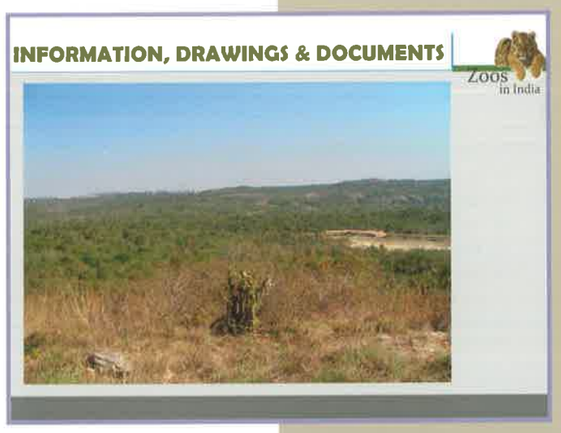
1) A design brief from the client
2) Concept plan
3) Preliminary plan
4) Final Master Plan
5) Landscape layout
6) Architectural drawings
7) Services drawings
   - i) Plumbing drawings
   - ii) Sewerage
   - iii) Stormwater drainage
   - a) Electrical drawings
   - b) Mechanical
   - c) Security system etc.

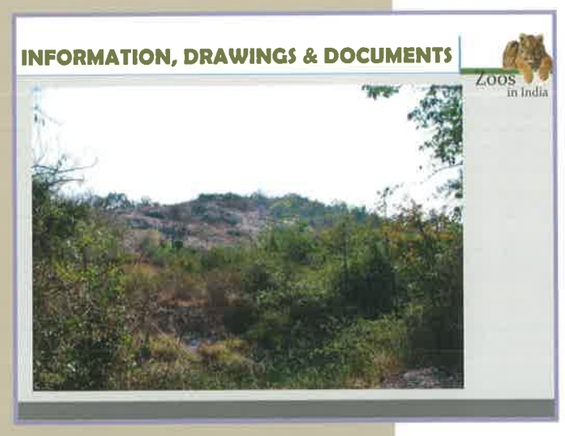
INFORMATION, DRAWINGS & DOCUMENTS

Zoos in India

Topographic Survey Requirements

1. Property Lines Data
2. Property Lines Data
3. Bench Mark
4. Spot Levels
5. Orientation
6. Location/ Alignment/ Dimensions of the following:
7. Area of the Site.


INFORMATION, DRAWINGS & DOCUMENTS
Zoos in India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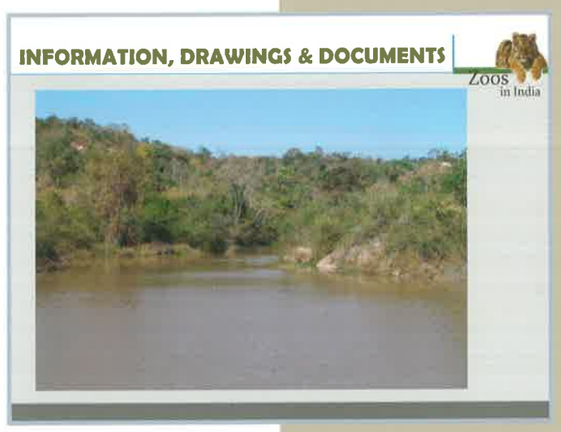
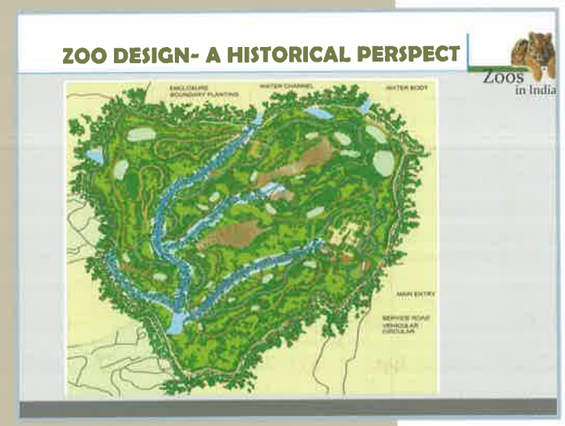
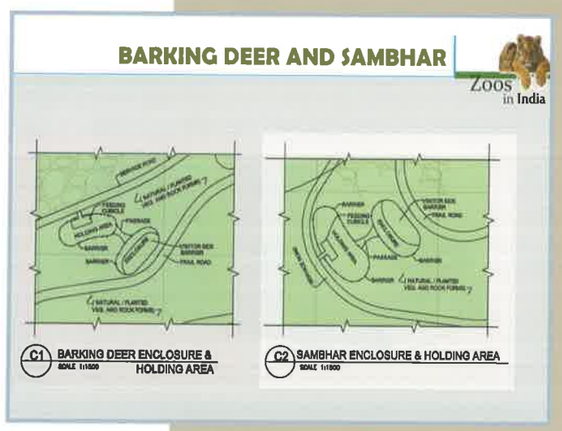
Zoos in India

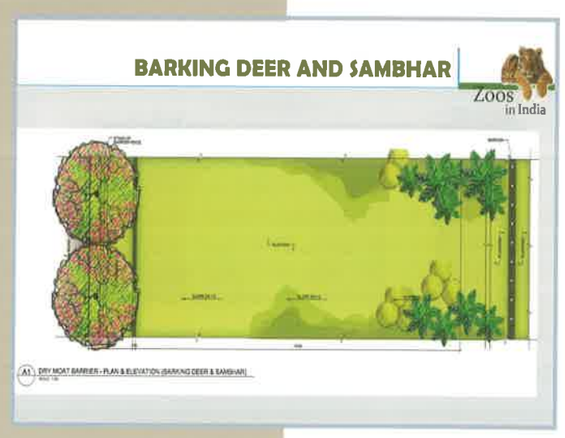

INFORMATION, DRAWINGS & DOCUMENTS
Zoos in India

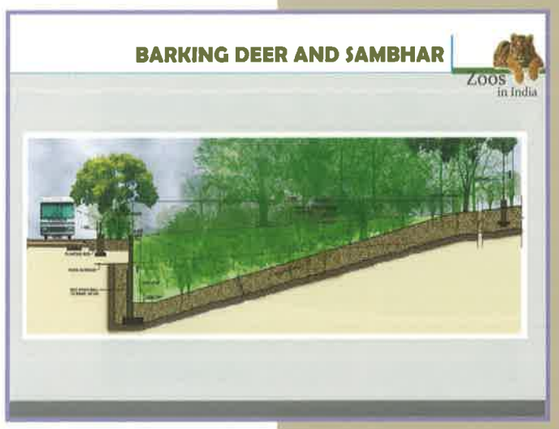

ZOO DESIGN- A HISTORICAL PERSPECT
Zoos in India

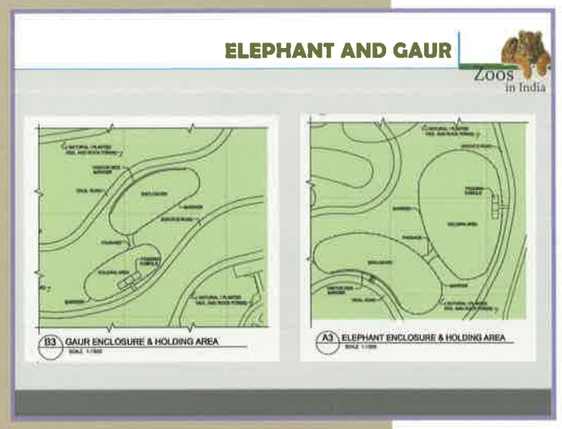

ZOO DESIGN- A HISTORICAL PERSPECT
Zoos in India

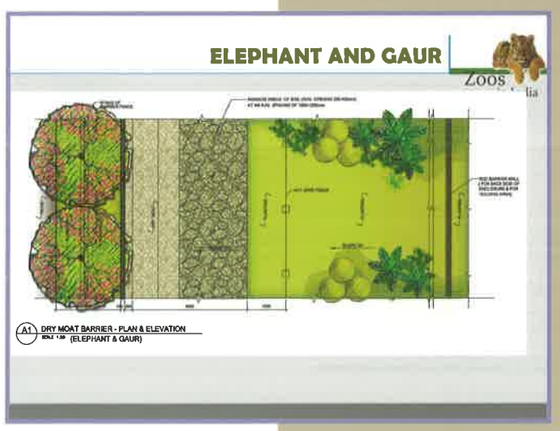

ZOO DESIGN- CONTEMPORARY CONCEPTS
Zoos in India

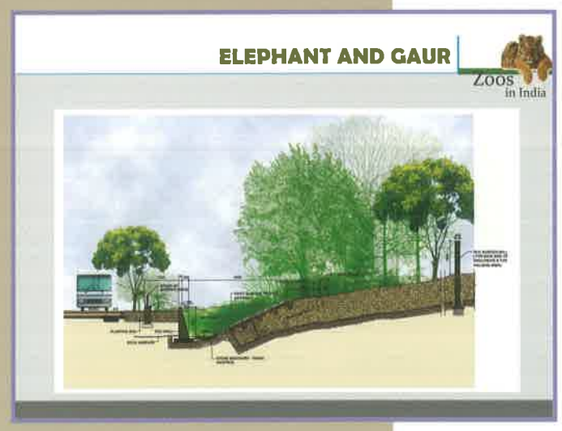

BARKING DEER AND SAMBHAR
Zoos in India
C1 BARKING DEER ENCLOSURE & HOLDING AREA
SCALE 1:1000
C2 SAMBHAR ENCLOSURE & HOLDING AREA
SCALE 1:1000

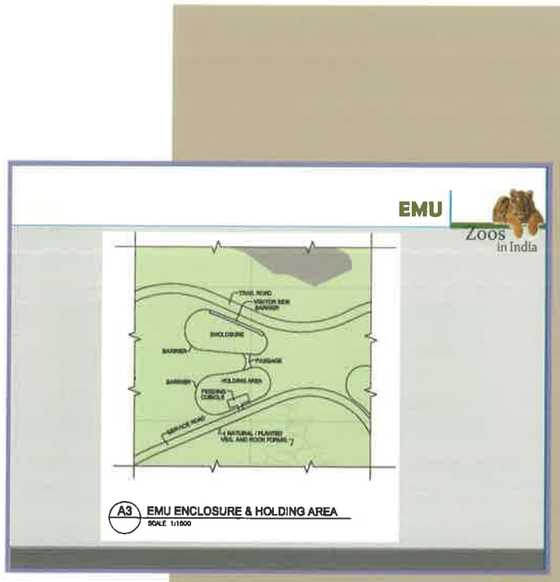

BARKING DEER AND SAMBHAR
Zoos in India
A1 DRY MOAT BARRIER - PLAN & ELEVATION (BARKING DEER & SAMBHAR)


BARKING DEER AND SAMBHAR
Zoos in India


ELEPHANT AND GAUR
Zoos in India
B3 GAUR ENCLOSURE & HOLDING AREA
A3 ELEPHANT ENCLOSURE & HOLDING AREA


ELEPHANT AND GAUR
A1 DRY MOAT BARRIER - PLAN & ELEVATION
(ELEPHANT & GAUR)

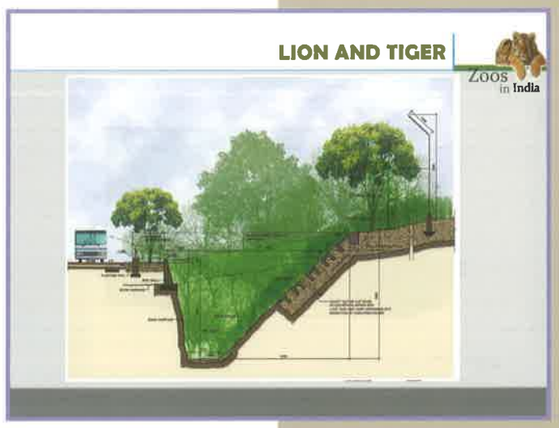

ELEPHANT AND GAUR
Zoos in India

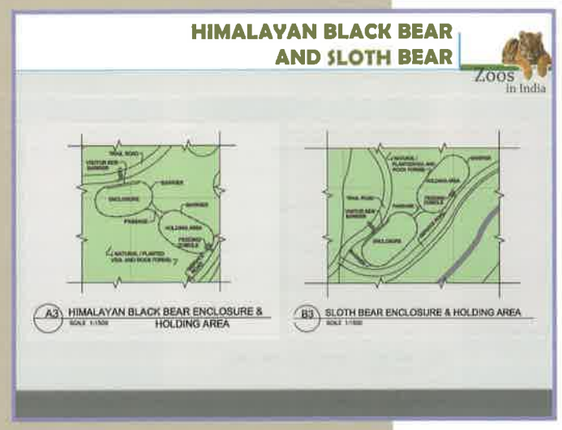

EMU
Zoos in India
A3 EMU ENCLOSURE & HOLDING AREA
SCALE 1:1000


EMU
Zoos in India
A1 DRY MOAT BARRIER - PLAN & ELEVATION (EMU)


EMU
Zoos in India


LION AND TIGER
Zoos in India
A1 DRY MOAT BARRIER - PLAN & ELEVATION
(LION & TIGER)


LION AND TIGER
Zoos in India

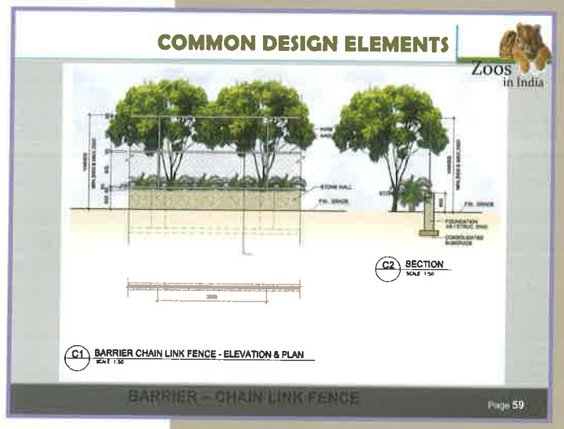

HIMALAYAN BLACK BEAR AND SLOTH BEAR
Zoos in India
A3 HIMALAYAN BLACK BEAR ENCLOSURE & HOLDING AREA
B3 SLOTH BEAR ENCLOSURE & HOLDING AREA

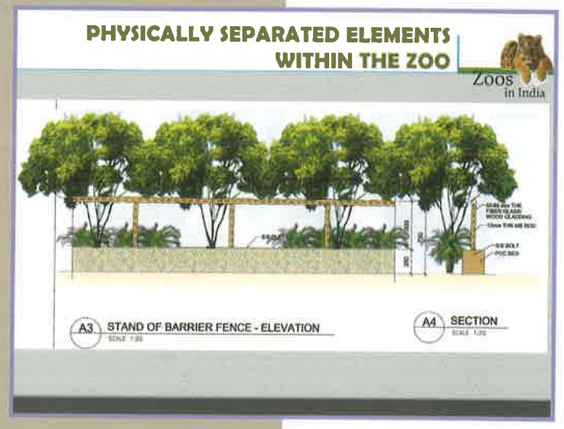

HIMALAYAN BLACK BEAR AND SLOTH BEAR
Zoos in India
A1 DRY MOAT BARRIER - PLAN & ELEVATION (HIMALAYAN BLACK BEAR & SLOTH BEAR)

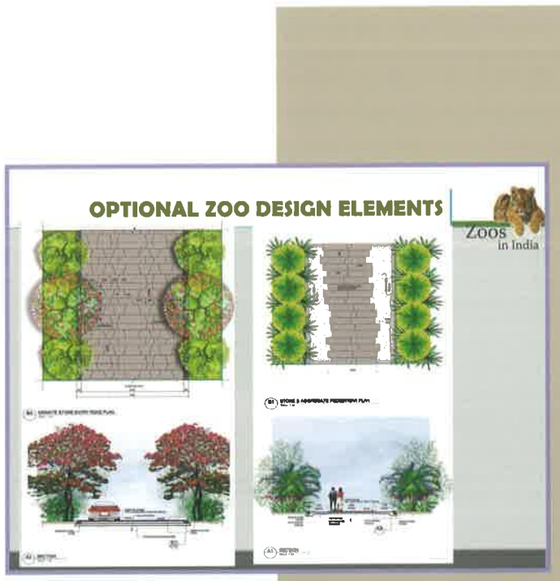

HIMALAYAN BLACK BEAR AND SLOTH BEAR
Zoos in India


HIMALAYAN BLACK BEAR AND SLOTH BEAR
Zoos in India
A3 HIMALAYAN BLACK BEAR ENCLOSURE & HOLDING AREA
B3 SLOTH BEAR ENCLOSURE & HOLDING AREA

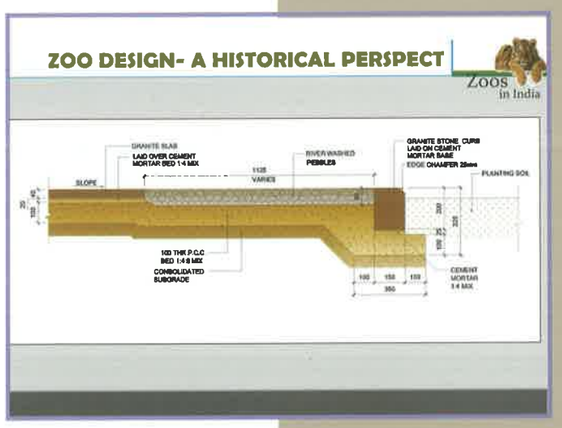

ZOO DESIGN- INDIAN SCENARIO
Zoos in India
PLAN
SECTION

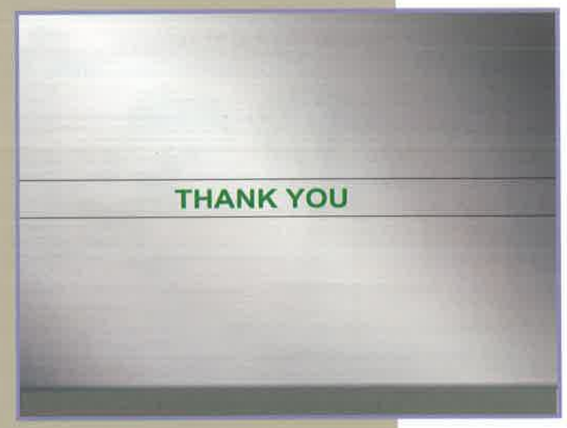

COMMON DESIGN ELEMENTS
Zoos in India
C2 SECTION
C1 BARRIER CHAIN LINK FENCE - ELEVATION & PLAN
BARRIER – CHAIN LINK FENCE
Page 59


PHYSICALLY SEPARATED ELEMENTS WITHIN THE ZOO
Zoos in India
A3 STAND OF BARRIER FENCE - ELEVATION
A4 SECTION


OPTIONAL ZOO DESIGN ELEMENTS
Zoos in India


ZOOS VISITED – BRIEF INFORMATION
Zoos in India


ZOO DESIGN- A HISTORICAL PERSPECT
Zoos in India
GRANITE SLAB
LAID OVER CEMENT
MORTAR BED 1:4 MIX
SLOPE
1125
VARIES
RIVER WASHED
PEBBLES
GRANITE STONE CURB
LAID ON CEMENT
MORTAR BASE
EDGE CHAMFER 25mm
PLANTING SOIL
100 THK P.C.C
BED 1:4:8 MIX
CONSOLIDATED
SUBGRADE
CEMENT
MORTAR
1:4 MIX


THANK YOU

Technical Session 4

Designing of barriers in zoos
Speaker : Dr Brij Kishor Gupta, Evaluation & Monitoring Officer, Central Zoo Authority, New Delhi

Dr. Brij Kishore Gupta in his presentation "Designing of barrier in zoos" stressed upon essentiality of barrier in safety of both animal and visitor, explained about barriers in different zoos, different types of barriers, importance of barriers and also made a note on animal type & barrier recommendations for zoos.

Principles and Standards for Barrier Design

- by Dr Brij Kishore Gupta

Introduction

At the beginning of the 21st century, zoo exhibit design around the world is in developmental phase that includes thematic display of ecological niches, simulation of animals' natural habitats, and the creation of mixed species exhibits. Today the quality of a zoo is no longer measured by the number of species it bears, but by the quality of its exhibits, its educational programs and research and conservation activities. In last 5 years, zoo exhibit design in India has undergone a metamorphosis leading to a significant improvement in the quality of animal care. This is due to the establishment of the Central Zoo Authority(CZA), a statutory body under the Ministry of Environment & Forests, Govt. of India in 1992.

However, recent surveys show that in the majority of Indian zoos, most animals are still kept in cages. It is time to eliminate such cage structures and provide physical and visual barriers.

A major issue that most zoos have to deal with is the harassment of animals. This may happen through remote means i.e. throwing of objects to animals or by direct means where visitors try to enter the enclosure. Many zoos feel that this can be avoided by providing very high barriers. But that would defeat the very purpose of a zoo - for visitors to see and learn about the animals. So the harassment can be effectively dealt with using effective zoo management and education of visitors.

Zoos in India

In India, zoos originated as small animal collections attached to gardens and parks. The first public zoo in India was set up at Madras in 1854. This was followed up by several zoos by various princely states like Trivandrum, Junagarh, Jaipur, Baroda, Udaipur, Bikaner and Jodhpur, and public zoos at Bombay and Calcutta and later at Lucknow and Gwalior in 1901. The zoos were operated with a park concept with enclosures of cage type with iron rods, chain-link mesh/welded mesh as barriers.

An open moated zoo was first established in Delhi in 1959. State Governments also followed the suit, and several well planned zoos were set up in many big cities. Such zoos constructed naturalistic enclosures with moats (dry and wet) as barriers for exhibiting animals such as, the Vandalur Zoo and Vishakhapatnam Zoo. However, the zoos with space constraint such as the Indore Zoo, VOC Park Zoo, Coimbatore, Lucknow Zoo etc, cannot provide large moated enclosures. A large number of menageries and mini zoos were established later, wherein little attention was paid to the well being of the animals and their management on scientific lines e.g. Kamla Nehru Prani Sangrahalaya, Indore; VOC Park Zoo, Coimbatore; Maharajabaug Zoo, Nagpur etc. The 1970s and 1980s witnessed manifold increase in the number such Zoos which at that time looked appropriate but today are considered to be ill conceived.

Barriers - An Overview

Barrier dimensions : In a zoo, barriers are needed to separate animals from visitors. The barrier will always be a physical barrier and may be also with a visual barrier. The Central Zoo Authority in the 'Recognition of Zoo Rules' has formulated the same. In designing a barrier, since the primary concern is public safety, it is important to know the behaviour and biology of the species, so that the minimum depth and width of the barrier can be maintained to avoid animal escape.

Moats vs. Cages : The main advantage of a moated enclosure is to have an open naturalistic space, where the animals may display their natural behaviour. Today, caged enclosures at Kamla Nehru Zoo, Ahmedabad; Alipore Zoo, Calcutta; Gandhi Zoo, Gwalior; Trivandrum Zoo etc. are being replaced by naturalistic moats. Zoos at Tirupati, Vishakhapatnam have used their natural landscape to form naturalistic moats. There are examples of new zoos, located away from cities, being developed with large naturalistic enclosures at Andaman & Nicobar Islands (Biological Park, Chidiyatapu), Rajasthan (Nahargarh Biological Park, Jaipur), Gujarat (Rajkot Zoo, Nature Park, Surat) and Maharashtra (Peshwe Park Zoo, Pune).

Naturalistic moats : The naturalistic moats are preferred as they look less engineered and resemble the animal's habitat. Over the years the zoos at Delhi, Chhatbir, Hyderabad, Chennai, Vishakhapatnam and Tirupati have constructed large moated naturalistic enclosures as space is not a constraint for them.

Hidden barriers : A hidden barrier is one that makes it impossible or at least difficult, for visitors to determine what the physical limits of the animal's area are. A greater excitement can be generated by giving deeper sense of being part of the animal's world. Barriers can be disguised as a natural feature like a stream, a rock outcrop, eroded bank of a river edge and so on to screen unwanted views, such as the Elephant enclosure and Pelican exhibit at Vishakhapatnam Zoo and Sloth bear enclosure at Tirupati Zoo. Fences hidden in depressed landforms like, streams and water bodies appropriate to the exhibit, can also create an illusion of freedom while protecting viewer from the animal and just as importantly, the animal from the viewer.

Older zoos, however, have to make do withold fashioned moats until new exhibits can be constructed. In such zoos, it is recommended that linear planting in the form of natural (not shaped) hedges be used to keep visitors back from the physical barrier of an animal exhibit. The hedges will need to be protected from being trampled over by enthusiastic visitors by kick rails or hand rails. Also, creepers /climbers that hang down over the moat wall can be effectively used to hide the large expanses of concrete in such zoos.

Respecting the Animal : The saying that 'looks down on what we despise, and look up to what we admire' is a metaphor that works well in zoo exhibitory. In olden days, exhibits in zoos routinely placed dangerous animals in a visual pit. Such exhibits only encouraged visitors to view the animal with contempt and fear and at worst, throw objects at it. Animal exhibit areas should be designed along with the barriers to place the animal either at or above human eye-level. This makes exhibit more interesting and impressive to the viewer and the animal gets due respect.

Controlled Viewing : Animal exhibit areas and barriers should be designed in such a way that cross views of people are avoided. The undesirable aspect of 360 degree viewing, common in many older zoos, where animal is placed as if in a circus surrounded by people. This lets the visitors concentrate on their own, rather than viewing the animal and thus, creats greater disrespect for the animal.

Viewing locations and barriers should also ensure that visitors cannot see entire exhibit area from any one point or from all points (360 degree viewing) as has been done in many zoos like Herbivore enclosure at Indore Zoo, Chimpanzee enclosure at Alipore, Monitor lizard and Snake enclosures as Indira Gandhi Zoological Park, Vishakhapatnam. Such viewing makes the visitor lose interest very quickly in the exhibit and the animal.

Wherever possible, a larger number of viewing points or viewing windows should be planned to give the visitors special views of the animals. In the case of certain animals e.g. lions and tigers, where visitors are bound to congregate, the length of viewing area can be divided to increase the viewing opportunities for visitors. Zoos should provide viewing for certain special exhibits through well designed 'hides' which will provide more intimate viewing as found in the Underwater otter viewing at Hyderabad and amphibian exhibit at Vandalur Zoo.

Tree Protection : While designing new natural habitat on undisturbed natural sites, it is desirable that the areas remain as undisturbed as possible. Animals should be located in areas of the site that most closely resemble their natural habitats, depending on the openness or density of the existing forest cover, so that minimal modifications are necessary for which all mature trees should be retained. These existing trees should be protected from animal browsing, by techniques like fencing, wire mesh wrapping for the trunk or electric wires.

Netted aviaries : In a bird aviary, the barrier is the entire structure itself. Rigid structure aviaries were constructed in zoos for decades which actually resemble animal cages. However, such aviaries are expensive due to the cost of the steel structure and have limited space. Netted aviaries by comparison can be made substantially big in size due to their much lighter structural weight and offer a lot more space for birds. Such aviaries are being used in most progressive zoos around the world and in India.

Summary of Barrier Types

There are essentially four purposes to the barrier design around an exhibit. These are:

Physical barrier : to prevent the animal from escaping as well as to discourage visitors from attempting to enter the exhibit

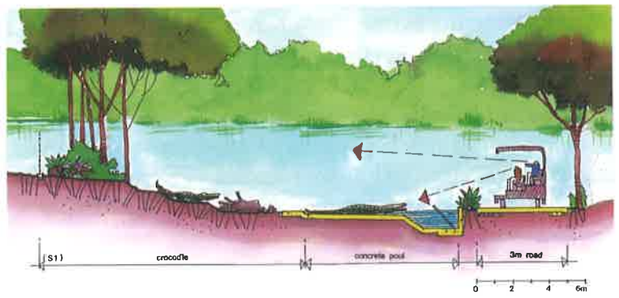
Visual barrier : to screen unwanted views of holding buildings, service areas, moats

Visual connections : to focus visitor's attention on special views into the exhibit

In general, the animal species is dangerous to human beings if loose, and its ability or inability to jump or climb determines the physical barrier as shown in the table below 2.2.1 to 2.2.4:

Animal Types & Barrier Recommendations

Animal Type	Examples	Front barrier	Rear barrier
Terrestrial species / jumping & climbing	Tiger, Asiatic Lion	U-shaped dry or wet moats, glass viewing structures at special viewing areas	U-shaped dry moats OR high chain-link fences OR high rock walls
Terrestrial species / jumping	Jackal, Wolf, Hyena	V-shaped (flat bottomed) dry moats with/without chain-link fences	V-shaped (flat bottomed) dry moats OR chain-link fences
Arboreal species / climbing	Himalayan Black Bear, Sloth Bear	U-shaped / V-shaped dry moats	U-shaped / V-shaped dry moats OR high smooth walls, OR overhanging rock walls
Arboreal species / jumping & climbing	Monkeys, Lion - tailed Macaque, Langur, Nilgiri Langur	U-shaped / V-shaped dry moats, shallow wet moats, netted aviaries with glass viewing	U-shaped / V-shaped dry moats OR shallow wet moats, netted aviaries
Terrestrial species / jumping	Blackbuck, Spotted Deer, Barking Deer, Sambar, Nilgai	V-shaped (flat bottomed) dry moats with or without chain-link fences	V-shaped (flat bottomed) dry moats OR chain-link fences
Terrestrial / non – jumping	Gaur, Wild Boar, Rhinoceros, Asian Elephant	V-shaped dry moats	V-shaped dry moats OR low walls (clay banks), cattle grids (gaur)
Aquatic & semi-aquatic species / non-jumping	Hippopotamus, Crocodile, Otter	Wet moats (exhibit pools)	Low walls (clay banks)



Physical Barrier Types

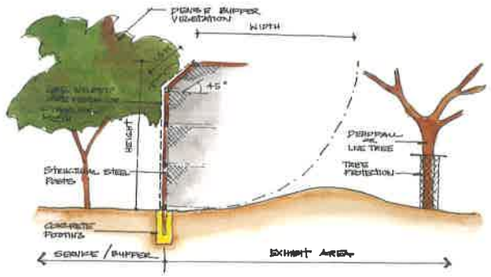
Barrier Type	**Advantages**	**Disadvantages**
Moats - u shaped (vertical sides)	1. No contact with animals 2. Less chances of transmission of infectious disease from visitors	1. Needs large areas 2. Improper drainage can lead to proliferation of parasitic load 3. structural design makes these very expensive to build 4. animals can fall into moat areas hurting themselves
Moats - v shaped (sloped sides)	1. Reduced contact with animals 2. less expensive to build than U-shaped moats 3. more natural looking than U-shaped moats	1. Needs large areas 2. Improper drainage can lead to proliferation of parasitic load 3. animals can walk into moat areas making them less visible to visitors
Fences – chain-link, welded wire mesh	1. Requires much smaller area than moats 2. inexpensive to build 3. can be hidden easily with vegetation	1. Visitor vandalism 2. High maintenance 3. clear viewing requires expensive glass viewing areas
Glass – laminated tempered	1. Close visual connection between visitors and animals 2. Provides privacy to animals by insulating from noise 3. requires much smaller area than moats	1. Reflection of light off glass surfaces reduces visibility 2. frequent cleaning required 3. expensive to construct
Low walls to simulate clay banks	1. Natural looking 2. Enrichment possibilities - nocturnal animal and reptiles may use for clinging, hibernation, aestivation 3. requires much smaller area than moats	1. Authentic looking clay banks can be expensive to construct
High walls to simulate rock cliffs	1. Natural looking 2. requires much smaller area than moats	1. Authentic looking rock cliffs can be very expensive to construct

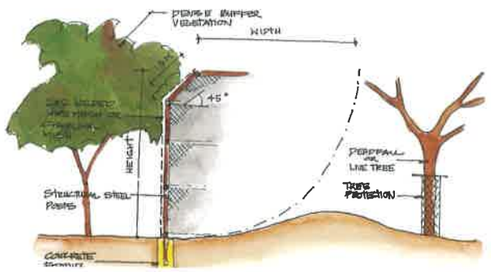
Visitor Barrier Types

Barrier Type	Advantages	Disadvantages
Steel guard-rail	1. Long lasting 2. Maintenance free 3. Safe - good for dangerous animal exhibits	1. Expensive to construct 2. Relatively unattractive to look at
Hardwood guardrail	1. Attractive to look at - fits most natural habitat themes 2. Relatively safe - good for non-dangerous animal exhibits	1. Expensive to construct with hardwood 2. Can rot in high humidity climates
Bamboo guardrail	1. Attractive to look at - fits most natural habitat themes 2. Inexpensive to construct	1. Relatively weak - should be used for non-critical areas 2. Needs replacement every few years
Eco-wud (wood substitute) guard-rail	1. Long lasting 2. Maintenance free 3. Cheaper than hardwood or steel 4. Relatively safe - good for non-dangerous animal exhibits	1. More expensive than bamboo 2. Appearance may not suit all theme areas
Low hedge	1. Attractive to look at 2. Inexpensive to install	1. Not a real barrier - can be broken through easily 2. Needs regular maintenance and protection from vandalism
Nylon rope kick rail	1. Very inexpensive to construct	1. Not a real barrier - should be used for landscape protection 2. Needs replacement every few years

Visual Barrier Types

Barrier Type	Advantages	Disadvantages
Walls (brick, concrete)	1. Long lasting 2. Easy to construct 3. Maintenance free	1. Expensive to construct 2. Unattractive to look at unless hidden
Bamboo/ cane fences	1. Attractive to look at - fits most natural habitat themes 2. Inexpensive to construct 3. Easy to install	1. Needs maintenance and protection from vandalism 2. Replacement every few years
Hedges	1. Attractive to look at 2. Inexpensive to plant	1. Needs regular maintenance and protection from vandalism
Green walls (moss, creepers)	1. Attractive to look at - fits most natural habitat themes	1. Expensive to construct 2. Needs maintenance and protection from vandalism
Artificial rockwork	1. Attractive to look at - fits most natural habitat themes 2. Long lasting 3. Maintenance free	1. Very expensive to construct 2. Needs specialized fabricators to obtain realistic results





Sharing of experience on landscape and zoo designing
Speaker : Mr. Waheed Ahmed, Curator, Nehru Zoological Park, Hyderabad

Presentation of Mr. Waheed Ahmed, curator Nehru Zoological Park, Hyderabad gave a picture of the park which is dedicated to the breeding programmes of Tigers, Lions, Pheasants & Birds. He also mentioned about the CZA-funded conservation breeding programme of endangered Mouse deer & critically endangered Vultures.He also told about the conservation, education, conducting awareness programmes and about the best enclosures of Nehru Park with merits & demerits and focused on Nocturnal Animal House which was constructed first time in India.

Sharing Experiences on Landscapes and Zoo designing - Nehru Zoological Park, Hyderabad

- by MA Waheed

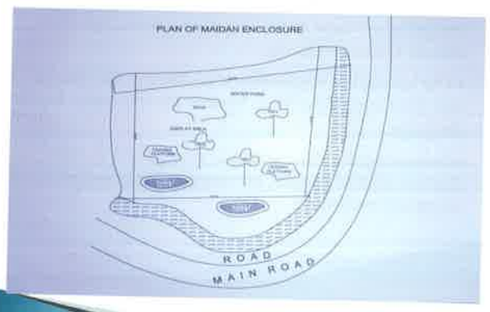
Best enclosures of Nehru Zoological Park, Hyderabad

Maidan enclosure

Housing Capacity:200 Animals

Dimensions

Display area: 28105 sqm
Depth of the enclosure:170 m
Enclosure Barrier type: Partially wet moat



Standoff Barrier:

Iron rail with Chlerodendran live hedge

Distance between chain link and parapet wall: 0.70 m

Vegetation in the exhibit area:

Azadirachta indica (Neem)
Pithecellobium Dulce (Seema chinta)
Acacia nilotica (Babul)
Tamarindus indica (Tamarindus)
Albizia saman (Rain tree)
Pongamia pinneta (kanuga)
Phoenix (Palm tree)

Merits:-

- Naturalistic look because of greenery in the enclosure, vegetation type and enclosure enrichment.
- Dry moat helps prevent water born diseases.
- No chance for the injury to the animal even if falls accidently inside the moat.
- Some area 1/3 is lush green round the year due to Miralam tank seepage water.
- Looks like natural forest.
- Water sources and feeding platforms help the animals to have fresh water and feed through the enclosure look like natural forest.

Demerits:-

- Frequent maintenance is required by periodic trimming of trees and overgrown Grasses as it affects visitor visibility.
- The excessive vegetation may harbor the insects and flies which can be a Source for the insect borne diseases.
- Ferroconcrete resting shade is required in the display area to protect the animals from extreme weather conditions.

Sambar enclosure

Housing Capacity: 30 Animal

Dimensions

- Animal House size: - 11.90x5.8=69.02 sq m
- Display area: 38x115=4370 sq m
- Depth of the enclosure:44 m(including water moat)

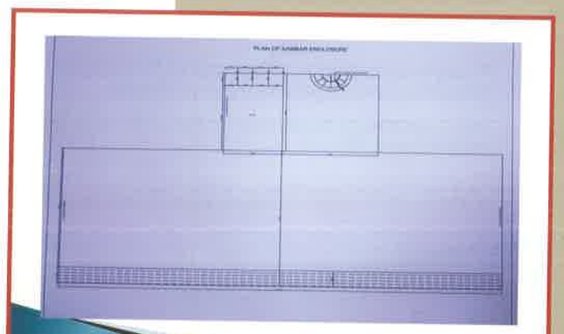
Enclosure Barrier type: Wet moat with flat bottom

Moat dimensions:

- Top Width - 6m
- Height - 2.5m

Standoff Barrier: G.I pipes with Chlerodendran live hedge

Distance between G.I pipes and moat: 0.5 m



Vegetation in the exhibit area:

Cassia siamea (Kashid)
Bauhinia variegata (Creeper)
Gliricedia sepium (Gliricedia)
Acacia nilotica (Babul)

Merits:-

- Naturalistic look because of presence of vegetation and undulating topography with natural rocks greenery in the enclosure, vegetation type and enclosure enrichment.
- Most of the enclosure area is covered with grass.
- No chance for the injury to the animal even if falls accidently inside the moat.
- Natural rocks and plain land gives a look of grass land area.

•Enough space for the animals to move and run around without risk of injury.
•Visitor viewing area is restricted to 30%.
•Natural wallow pits and rubbing posts available.

Demerits:

•Frequent maintenance is required by periodic trimming of trees and overgrown shrubs.
•The animals may consume water from wet moat which is not filtered.

Lion enclosure

Housing Capacity: 4 Animals

Dimensions

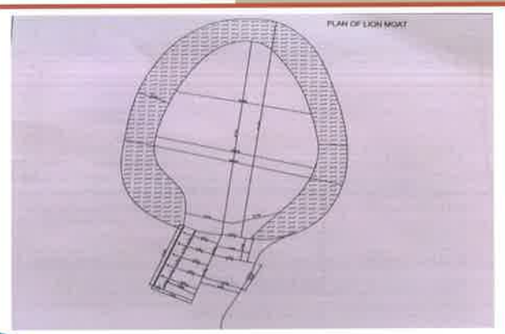
1) Animal House size: (1.60 X 2.40) X 4 =15.36 sq m
2) Animal Keeper corridor size: 9.4 x 1.4= 13.16sq m
3) Exhibit area: 50 X 45=2250 sq m
4) Depth of the enclosure: 50 m

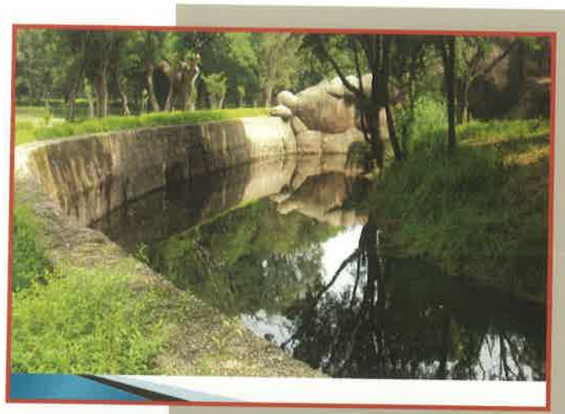
Enclosure Barrier type: wet moat with flat bottom

Moat dimensions:

1) Top Width - 10 m
2) Height - 4 m

Stand off barrier: G.I. pipes with Chlerodendran live hedge
Distance between G.I. pipes and moat : 0.50 m





Vegetation in the exhibit area:

Azadirachta indica (Neem)
Pithecellobium Dulce (Seema chinta)
Santalum album (Sandal wood)
*Tamarindus indica (*Tamarindus)
Albizia saman (Rain tree)
Gliricedia sepium (Gliricedia)
Albizia odoratissima (Dirsanam)
*Phoenix (*Palm tree)

Merits:

- Naturalistic look because of greenery in the enclosure, vegetation type and enclosure enrichment.
- Ground soil is not visible from the exhibit area because of greenery of thick grass cover.
- Convenient resting place for lions at a height of visitor's eye level.
- Depth of the enclosure is more. Animal has privacy and can stay away from visitors.

Demerits:

- Frequent maintenance is required by periodic trimming of trees and overgrown Grasses as it affects visitor visibility.
- The water in the moat has to be disinfected periodically.
- Corridor in the night house needs extra width for the animal keeper's movement.

Royal Bengal Tiger enclosure

Housing Capacity: 4 Animals

Dimensions:

- Animal House size:(2.45X1.85)X18.13sqm.
- Animal keeper corridor: 9.8X1.4=13.72sqm
- Display area:44 X 70=3080 sq m
- Enclosure Barrier type: Wet Moat with flat bottom
- Depth of the enclosure:70 m

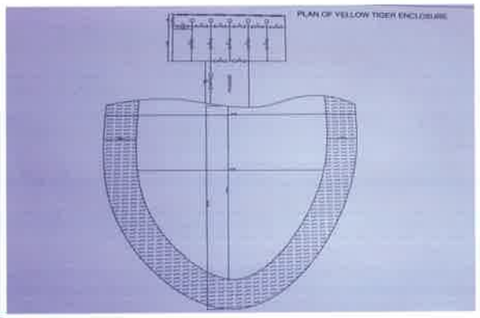
- Breeding Kraals size: 7x7=49 sq m
- Breeding animal house size:7x3.70=25.9 sq m

Moat dimensions:

1) Top Width - 10 m
2) Height - 4 m

Standoff Barrier: G.I pipes with Chlerodendron live hedge

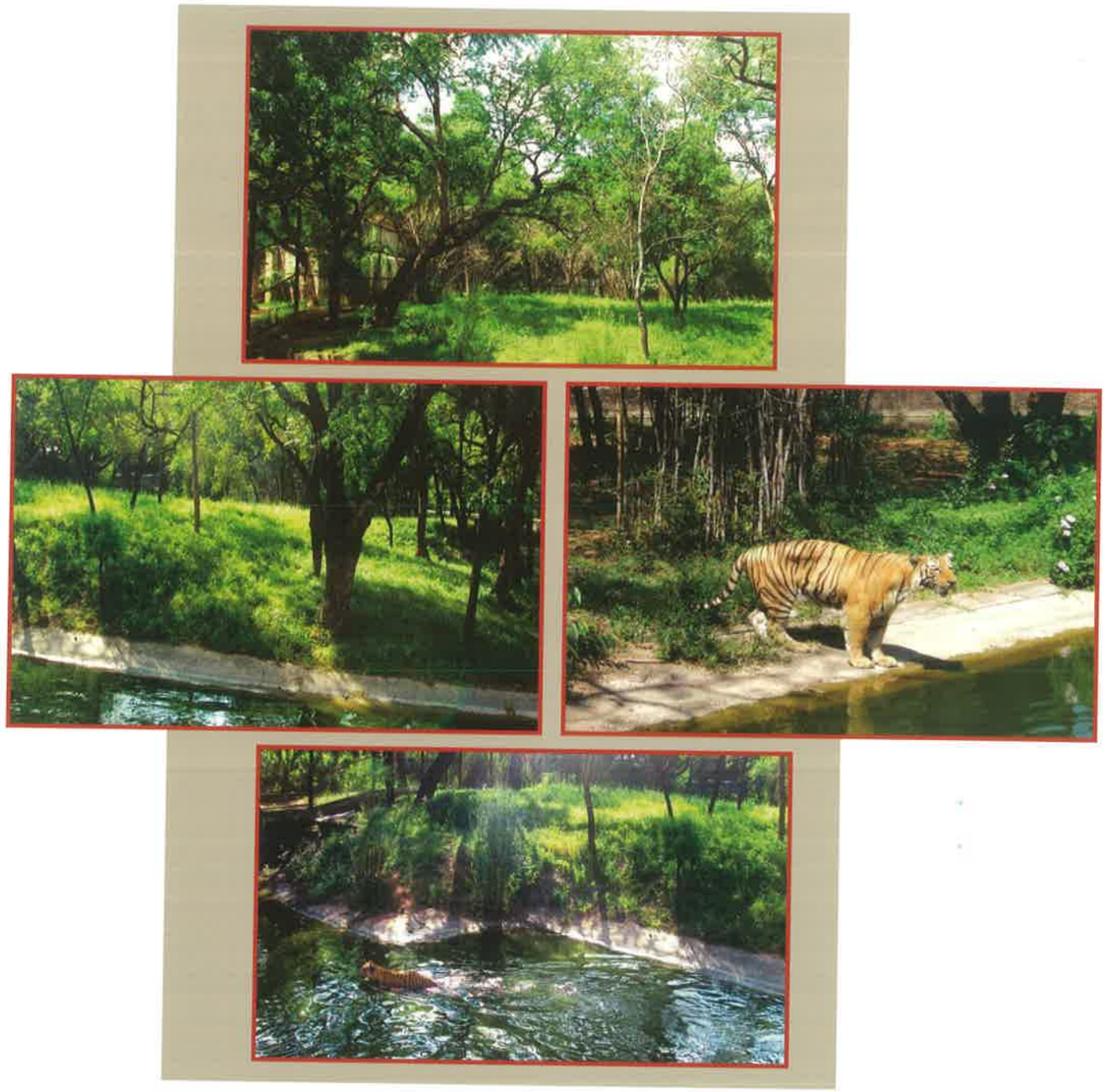
Distance between G.I pipe and moat:-0.50 m



Vegetation in the exhibit area:

Azadirachta indica (Neem)
Pithecellobium Dulce (Seema chinta)
Santalum album (Sandal wood)
Tamarindus indica (Tamarindus)
Albizia saman (Rain tree)
Albizia odoratissima (Dirsanam)
Delonix regia (Gulmohar)
Derris indica (kanuga)
Bambusa indica(Green Bamboo)

Lawsonia inermis (Mehndi)
Eugenia jambolana (Black jamun)
Phoenix (Palm tree)



Merits:-

•Naturalistic look because of greenery in the enclosure, vegetation type and enclosure enrichment.
•Ground soil is not visible from the exhibit area because of greenery of thick grass cover.
•Delivery house is next to enclosure, shifting of pregnant and young one is easy.
•Width is more than length hence animal moves freely.

Demerits:-

•Frequent maintenance is required by periodic trimming of trees and overgrown grasses as it affects visitor visibility.
•The excessive vegetation may harbor the insects and flies which can be a Source for the insect borne diseases.
•Animal house cages are of less size.

Lion Tailed Macaque

Housing Capacity: 6 Animals

Dimensions

1) Animal House size: (1.67 X 2.75)6=27.55 Sq m
2) Animal Keeper corridor size:1.98 X 12.20=24.156 sqm
3) Treatment area size: 3.35X2.75=9.2125 Sq m
4) Display area: 59.13 X 36.57=2162.38 Sq m
5) Depth of the enclosure:36.57 m

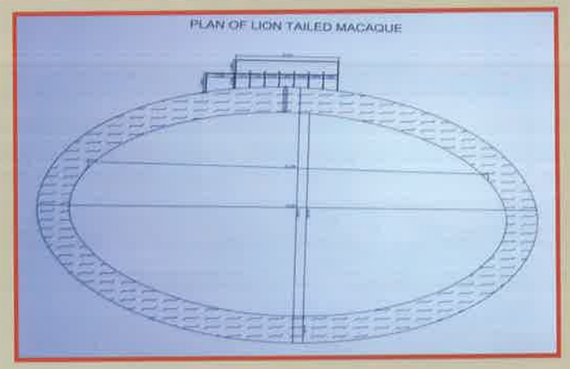
Enclosure Barrier type: U shaped Wet moat with flat bottom

Moat dimensions:-

1) Top Width - 6 m
2) Height - 5 m

Standoff Barrier: G.I pipes with Chlerodendron live hedge

Distance between G.I pipes and moat: 0.70 m



Vegetation in the exhibit area:

Azadirachta indica (Neem)
*Cordia myxa (*Cordia)
*Phoenix (*Palm tree)
*Teriminalia catappa (*Tropical almond*)*
Albizia saman (Rain tree)
Albizia odoratissima (Dirsanam)
Psidium guajava (Apple Guava)
Corinandrum
Syzygium cumini(Jambul)
*Bambox ceiba(*Silk cotton)
*Acacia nilotica (*Babul)

Merits:

•Naturalistic look because of greenery in the enclosure, vegetation type and enclosure enrichment.
•Around soil is not visible from the exhibit area because of greenery of thick grass cover
•Tall trees provide shelter to LTMs during day time.
•Good number of trees gives natural enrichment.
•Though 'U' shaped wet moat may 25% is viewing area.

Demerits:

•Frequent maintenance is required by periodic trimming of trees and overgrown grasses as it affects visitor visibility.
•The excessive vegetation may harbor the insects and flies which can be a Source for the insect borne diseases.

Nocturnal Animal House

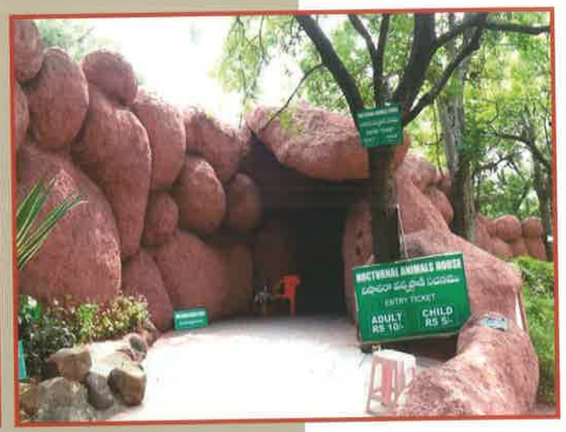
Housing Capacity: 20 - 30Animals

Dimensions

•Animal display House size:159.26sqm
•Visitor Passage area: 233.24sqm
• Animal Keeper corridor size:163.64sqm
•Enclosure type: "Cave type" with 14 cubicles

Displayed animals are:

- Slender loris
- Palm civet
- Leopard cat
- Jungle cat
- Porcupine
- Ratel
- Fruit bats
- Owls(6 species)



Merits:

- Enclosure constructed in such a way that people have a feeling as if they are going through a tunnel and sees the animals in their natural habitats without any disturbance.
- To make the nocturnal animals active during day time for the visiting public, the wake sleep cycle of the animal is reversed by simulated night condition, inducing the night time activities in the animals

- In this connection special arrangements are made to change the time of day gradually, that is from day light to dark and dusk to dawn, so that the animals are conditioned to the change of biorhythm in their routine life.

Demerits:

- Enclosures for birds are narrow
- Birds like owls are unable to fly in narrow animal houses.

Thank you

Sharing Experiences on Zoo Design
Speaker : Mr. KSSVP Reddy, Director, Arignar Anna Zoological Park, Vandalur

Mr. KSSVP Reddy, IFS, AAZP, gave a brief introduction about AAZP, Vandalur. And he explained about five best enclosures of AAZP and focused on LTM, and said that 35% of LTM's population available in the zoo & is a species coordinator for LTM breeding program. The speech also focussed on merits and demerits of the park.

Sharing Experiences on Landscapes and Zoo designing
- Arignar Anna Zoological park, Vandalur, Chennai

- by KSSVP Reddy

Welcome to

"DESIGNING OF ENCLOSURE AND LANDSCAPE" - FIVE SELECTED BEST ENCLOSURE OF ARIGNAR ANNA ZOOLOGICAL PARK

by
K.S.S.V.P.REDDY, I.F.S.,
Chief Conservator of Forests & Director

INTRODUCTION

- Arignar Anna Zoological Park started in 1985
- Spread an area of 602 hectares
- 100 enclosures
- 1372 specimens consisting of 146 species.

WALKTHROUGH AVIARY

- The old Bio-Centre was renovated.
- Green patches intersected with artificially created water streams – resembles the natural flow in the jungle streams.
- Iron mesh woven at a height of 15m facilitate the birds to take long flight.
- Specially designed pots hanging from the roof act as a natural nest of birds.
- Provided fruit trees and enriched with lot of vegetation.
- The micro climate provided in the walk through aviary-providing excellent opportunities to red vented bulbul, red whiskered bulbul, white browed bulbul, jungle babbler, rofous tree pie, rose ringed parakeet, Alexandrian parakeet, blue rock pigeon, wood pecker, common myna etc.,

DEMERITS

- Entry of snakes.
- Erratic power supply.
- Public disturbance.
- Despite these negligible demerits, excellent breeding works reported.

WALK THROUGH AVIARY

SIAMESE CROCODILE ENCLOSURE

- The old enclosure was demolished and new enclosure was constructed during 2009.
- Good visibility – without disturbance.
- Well designed stand-off barrier for proper movement of visitors.
- Easy drainage of water and cleaning the pond.
- Sand beds provided for basking and constructing nest.
- Green grass provided in the midst of sand beds.
- Deficiency : No service area is provided.

SIAMESE CROCODILE ENCLOSURE




LION TAILED MACAQUE

- Arignar Anna Zoological Park houses 23 lion tailed macaque (9:11:3).
- 35% of LTM's population available in the zoo's of India.
- Species coordinator for LTM breeding programme.
- Two exhibit enclosures and two off exhibit enclosures available. Three of them are wet moat enclosure.
- Out of four enclosure, one moat enclosure has got excellent facilities of enrichments (ladders, cradles, ropes, small mounds etc.,)
- A separate animal house and service area are available.

DEMERITS

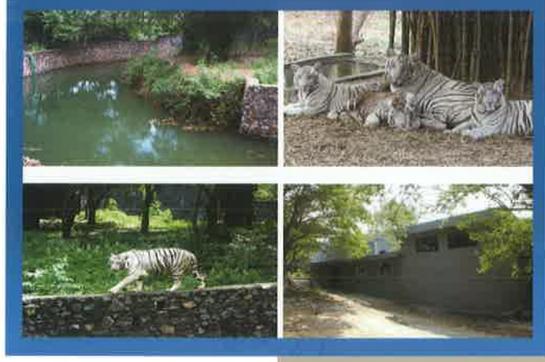
- Taking water from wet moat some time causes infection.

LION TAILED MACAQUE ENCLOSURE

WHITE TIGER ENCLOSURE

- Successful captive breeding of white tigers
- From one breeding pair, the population has increased to 9 with sex ratio of 3:6.
- The enclosure provided with bamboo trees, small resting water ponds and physical enrichment devices like wooden logs, support poles, etc.,
- The dry moat contains water almost throughout the year provides for excellent opportunity for the swimming and wallowing.
- Well ventilated animal house with sufficient cells are available for breeding and other management purpose.
- A new animal cell with a size of 15'x10' has been added recently.
- Solar lighting, blower fans etc., are provided.
- The pigeon holes inside the moat are giving excellent opportunity to the tiger cubs to develop the hunting instincts.

WHITE TIGER ENCLSOURE



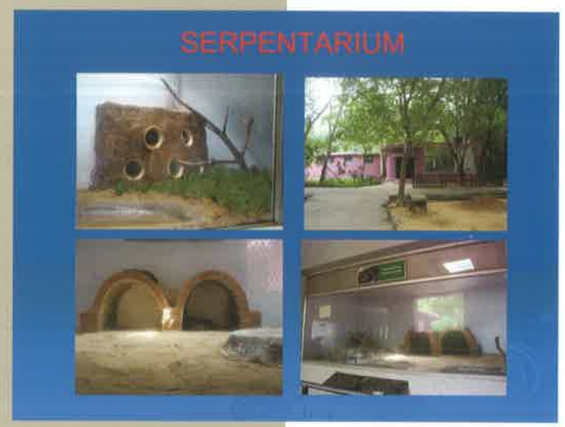
ELEPHANT ENCLOSURE

- 20 Hectares area provided to elephant .
- Housed inside the dry moat in the midst of good vegetation.
- Bamboos and other fruit bearing trees have been planted inside the moat.
- Thatched sheds provide for rest.
- Elephant bathing tanks, mud wallows with excellent water facilities provided.
- Only demerit is poor visibility.

ELEPHANT ENCLOSURE

SERPENTARIUM

- Houses 11 species of snakes (5 venomous and 6 non-venomous).
- Well designed cages made of brick walls (3 sides) and glass (exhibit side).
- The house is provided with service area.
- Rough surfaced stones – easy moulting.
- Small water ponds – drinking and maintains relative humidity.
- Grasses, wooden logs, tree branches and sand floor – to simulate natural environment.
- Incandescent bulbs – attracts insects for feeding
- Hiding places – built with earthen pots as mounts, in case of large sized species (Pythons) – arches. These provide temperature in the range of 24° C - 28° C which is the usual temperature for snakes (lesser than ambient temperature 30° C - 32° C).



THANK YOU

Sharing Experiences on Zoo Design
Speaker : Mr. Amitab Agnihotri, National Zoological Park, Delhi

Mr. Amitab Agnihotri explained about NZP, New Delhi with details of their five best enclosures, emphasizing on breeding history of Rhino, Lion, LTM etc, and focused on CZA norms of containment requirements

Sharing Experiences on Landscapes and Zoo designing - National Zoological Park, New Delhi

- by Amitab Agnihotri

NATIONAL ZOOLOGICAL PARK, NEW DELHI

- BEST FIVE ENCLOSURES :
  - **Indian Rhinoceros**
  - Asiatic Lion
  - Himalayan Black Bear
  - Lion Tailed Macaque
  - Black Buck

INDIAN RHINOCEROS – SURVEY PLAN

INDIAN RHINOCEROS : HOUSE

INDIAN RHINOCEROS : ARENA

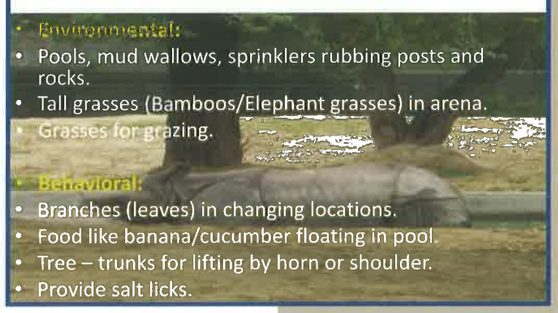
INDIAN RHINOCEROS

- ONE OF THE BEST ENCLOSURE
- ENCLOSURE CONSISTS OF –
  - – Large Arena – 8398 sqm.
  - – Night House (Cubicles) – 4 No.
  - – Kraals – 5No.
  - – Wallowing Pools – 2 No.
  - – Wet Moat with Power -Fence
  - – Tall trees & Green Grass

INDIAN RHINOCEROS : ENCLOSURE STATUS

- Size of the Cubicles:
- No Size
- 1 5.90x4.10x3 m
- 2 5.90x4.15x3 m
- 3 7.35x5.85x3 m
- 4 7.30x5.90x3 m
- Kraal- 9.40x15.20 m
- Keeper gallery-6.60x5.70x3 m
- Moat- width-4.80m depth-2.23m
- Arena- 8398 sqm.
- **It fulfills CZA'norms of containment requirements.**

INDIAN RHINOCEROS : ENRICHMENT



- Environmental:
- Pools, mud wallows, sprinklers rubbing posts and rocks.
- Tall grasses (Bamboos/Elephant grasses) in arena.
- Grasses for grazing.

- Behavioral:
- Branches (leaves) in changing locations.
- Food like banana/cucumber floating in pool.
- Tree – trunks for lifting by horn or shoulder.
- Provide salt licks.

INDIAN RHINOCEROS : VISITORS - LANDSCAPE

- ONE VIEWING SIDE
- FOOTPATH WITH HEDGE & STAND OFF BARRIOR.
- SHADY TREES ALONG THE FOOTPATH.
- RESTING BENCHES.
- NO VANDALISM.
- UNDULATING LANDSCAPE

INDIAN RHINOCEROS : BREEDING HISTORY

- FIRST MALE GIVEN BY ASSAM GOVT. IN 1962
- MALE PAIRED ON 01.12.1965 FROM ASSAM (COST OF THAT RHINOCEROS WAS Rs. 25,000/=)
- MAXIMUM HOLDINGS – 5 No.
- TOTAL BIRTHS IN NZP – 9 No.
- EXISTING POPULATION – 3 No.(1:2)
- PARTICIPATING ZOO IN NATIONAL CONSERVATION BREEDING PROGRAMME.

– Asiatic Lion

ASIATIC LION – SURVEY PLAN

ASIATIC LION:ARENA

ASIATIC LION : ARENA

ASIATIC LION

- ONE OF THE BEST ENCLOSURE
- ENCLOSURE CONSISTS OF –
  - – Large Arena – 1384 sqm.
  - – Night House (Cubicles) – 7 No.
  - – Kraals – 2No.
  - – Den – 1 No.
  - – Dry Moat on viewing side.
  - – Dry grass land, bushes & tall trees.

ASIATIC LION: ENCLOSURE STATUS

- Size of the Cubicles:
- No Size
- 7 6 Nos =2.35x1.35x3.90m
- 7th =2.35x1.40x3.90m
- Kraal-5.05x4.50(side kraal)
- 2.30x2.90x3.90m(cage kraal)
- Keeper gallery-10.75x3.70m
- Moat- width-8.10m depth 4.60 m
- Arena-1384 sqm.
- **It partly fulfills CZA' norms of containment requirements' as cubicles are small.**
- **Security and safety:-**
- Moat and side walls provide adequate security and safety.

ASIATIC LION: ENCLOSURE ENRICHMENT

ASIATIC LION : VISITORS - LANDSCAPE

- ONE VIEWING SIDE
- FOOTPATH WITH HEDGE & STAND OFF BARRIOR.
- SHADY TREES ALONG THE FOOTPATH.
- RESTING BENCHES.
- NO VANDALISM.
- FRONT SLOPING LANDSCAPE

ASIATIC LION : BREEDING HISTORY

- FIRST PAIR GIVEN BY JUNAGARH ON 14.05.1969
- MAXIMUM HOLDINGS – 12 No.
- TOTAL BIRTHS IN NZP – 36 No. IN 13 times
- EXISTING POPULATION – 7 No.(3:4)
- PARTICIPATING ZOO IN NATIONAL CONSERVATION BREEDING PROGRAMME.

– Himalayan Black Bear

HIM. BLACK BEAR– SURVEY PLAN

HIM. BLACK BEAR:HOUSE

HIM. BLACK BEAR: ARENA

HIM. BLACK BEAR

- ONE OF THE BEST ENCLOSURE
- ENCLOSURE CONSISTS OF –
  - – Large Arena – 1465 sqm.
  - – Night House (Cubicles) – 5 No.
  - – Kraals – NIL.
  - – Wallowing Pool – 1 No.
  - – Den for breeding (Off-Display)– 1 No.
  - – L- shape dry moat on viewing side.
  - – Dry grass land, bushes.

HIM. BLACK BEAR: VISITORS - LANDSCAPE

- ONE VIEWING SIDE
- FOOTPATH WITH HEDGE & STAND OFF BARRIOR.
- OFF- DISPLAY FACILITY WITH FEW VISITORS .
- NO VANDALISM.
- GOOD LANDSCAPE

HIM. BLACK BEAR: ENCLOSURE STATUS

Size of the Cubicle :

No	Size
5	1=2.20x1.35x2.63 m
	2=2.20x2.75x2.63 m
	3=2.20x1.30x2.60 m
	4=2.20x2.80x2.63 m
	5=2.20x1.25x2.63 m

Kraal-
Keeper gallery-12.35x1.35m
Moat- width-3.25m depth-2.93m
Arena- 1465 sqm.

- **It fulfills CZA'norms of containment requirements.**
- **Security and safety:-**
- Moat and stone/brick wall of enclosure provide adequate security and safety.

HIM. BLACK BEAR: ENCLOSURE ENRICHMENT

HIM. BLACK BEAR: BREEDING HISTORY

- TEN No. RECEIVED FROM DIFFERENT PLACES IN 1962.
- MAXIMUM HOLDINGS – 12 No.
- TOTAL BIRTHS IN NZP – 32 No. IN 20 times
- EXISTING POPULATION – 6 No.(2:3:1)

– Lion Tailed Macaque

LION TAILED MACAQUE– SURVEY PLAN

LION TAILED MACAQUE : HOUSE

LION TAILED MACAQUE: ARENA

LION TAILED MACAQUE

- ONE OF THE BEST ENCLOSURE
- ENCLOSURE CONSISTS OF –
  - – Large Arena – 808 sqm.
  - – Night House (Cubicles) – 3 No.
  - – Kraals – One.
  - – Wallowing Pool – Nil.
  - – Wet Moat with Power -Fence
  - – Medium sized trees & Green Grass

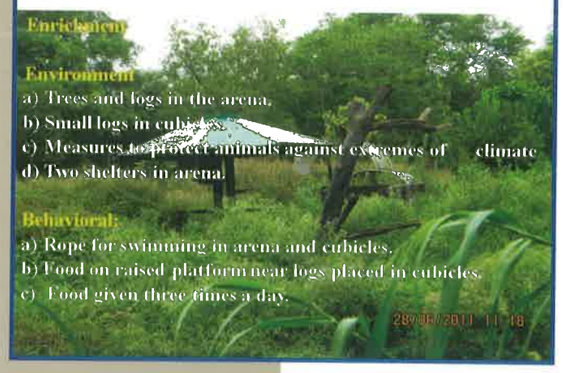
LION TAILED MACAQUE: ENCLOSURE STATUS

- **Status of enclosure is as under.**
- Cubicle

- No Size
- 3 2=1.55x1.90x2.4m
  (Passage)1=1.55x0.90x2.4 m
- Kraal-2.45x1.9 m
- Keeper gallery- Nil.
- Moat- width-7.30m depth-1.45m
- Arena- 808 sqm.

- **Cubicles do not fulfill CZA containment requirements while arena fulfills.**
- **Security and safety:-**
  Moat should remain full of water throughout year. Power fence be kept functional. Wet moat and power fence of enclosure provide adequate security and safety

LION TAILED MACAQUE: ENCLOSURE ENRICHMENT



LION TAILED MACAQUE: VISITORS - LANDSCAPE

- TWO VIEWING SIDES
- FOOTPATH WITH HEDGE & STAND OFF BARRIOR.
- SHADY TREES ALONG THE FOOTPATH.
- RESTING BENCHES.
- NO VANDALISM.
- GOOD LANDSCAPE

LION TAILED MACAQUE: BREEDING HISTORY

- SEVEN No. RECEIVED FROM WESTERN GHATS UPTO 1962.
- MAXIMUM HOLDINGS – 20 No.
- TOTAL BIRTHS IN NZP – 43 No.
- EXISTING POPULATION – 4 No.(2:2)

– Black Buck

BLACK BUCK– SURVEY PLAN

BLACK BUCK: HOUSE

BLACK BUCK: ARENA

BLACK BUCK

- ONE OF THE BEST ENCLOSURE
- ENCLOSURE CONSISTS OF –
  - – Large Arena – 5435 sqm.
  - – Night House (Cubicles) – 5 No.
  - – Kraals – 1No.
  - – Wallowing Pools – Nil.
  - – Dry Moat .
  - – Old & large trees OF Accacia.

BLACK BUCK: ENCLOSURE STATUS

- **Status of enclosure is as under.**

Cubicle

- No Size
- 5 2=2.60x2x2.95 m
  3rd =2.60x2.05x2.95 m
  4th =2.60x1.90x2.95 m
  Passage 5th =4.75x2.70x2.95 m
- Kraal-11.35x6.40m
- Keeper gallery- 9.25x2.00 m
- Moat- width-5.70m depth-2.37m
- Arena- 5435 sqm.

- **It fulfills containment requirement as per CZA norms.**

BLACK BUCK: BREEDING HISTORY

- SIX No. RECEIVED FROM DIFFERENT PLACES IN 1962.
- MAXIMUM HOLDINGS – 175 No.
- TOTAL BIRTHS IN NZP – 377 No.
- EXISTING POPULATION – 120 No.(49:59:12)

BLACK BUCK: VISITORS - LANDSCAPE

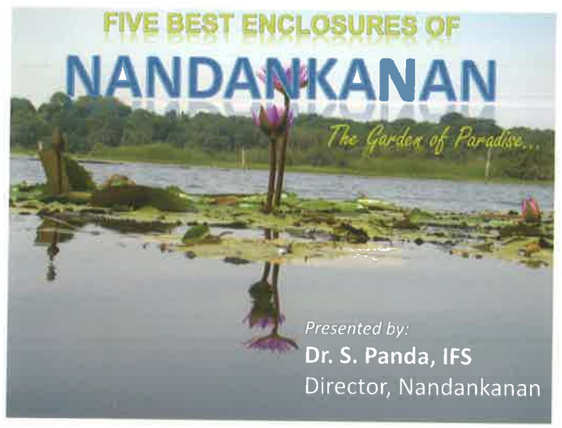
- ONE VIEWING SIDE
- FOOTPATH WITH HEDGE & STAND OFF BARRIOR.
- SHADY TREES ALONG THE FOOTPATH.
- RESTING BENCHES.
- NO VANDALISM.
- PLAIN LANDSCAPE WITH OLD ACCACIA TREES.

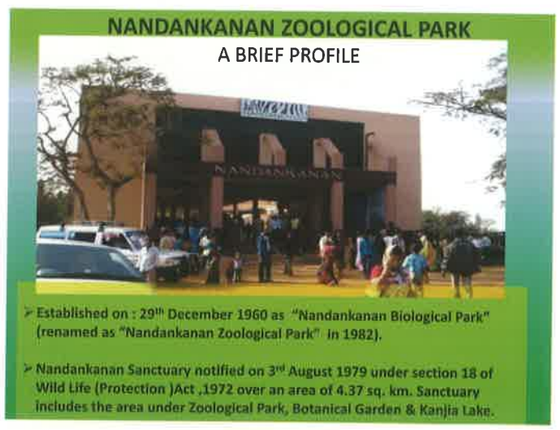
BLACK BUCK: ENRICHMENT

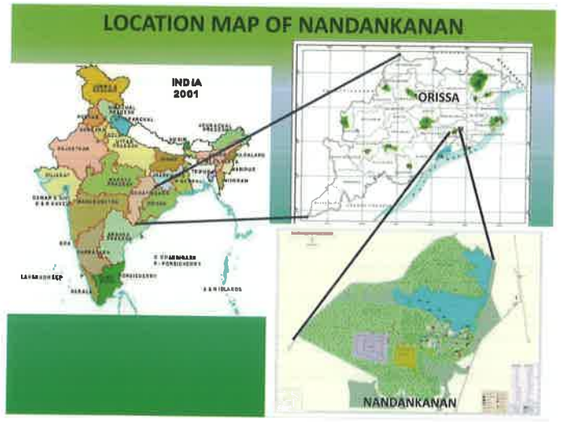
Sharing Experiences on Zoo Design
Speaker : Dr. Sudarshan Panda, Nandankanan Zoological Park, Bhubneshwar

Dr. Sudarshan Panda, IFS, Director Nandankanan Zoological Park, gave brief history about uniqueness of Nandankanan Zoological Park, with clear details of breeding, conservation breeding & education programmes and also explained about 5 best enclosures of Nandankanan Zoo.

Sharing Experiences on Landscapes and Zoo designing
- Nandankanan Zoological Park, Bhubneshwar
- by Dr Sudarshan Panda







PROFILE OF NANDANKANAN ZOOLOGICAL PARK

- Area – 362.1 ha
- 202 enclosures
- 108 cages & 94 moated enclosures
- 120 spp. (mammal – 40 sp.; bird – 56 sp. & reptile – 24 sp.)
- 1741 animals (mammal-690; bird-856 & reptile-195)
- Indigenous species - 88
- Exotic species - 32

UNIQUENESS OF NANDANKANAN

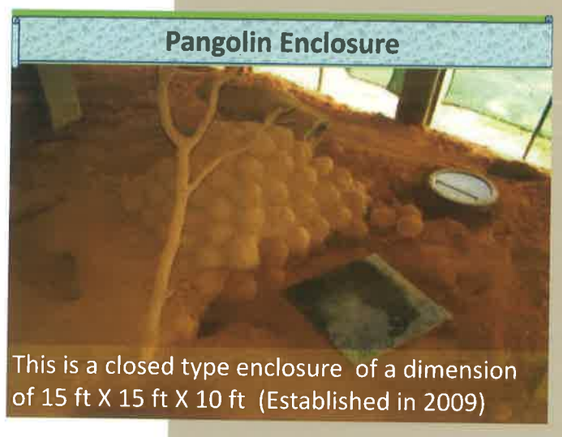
- ✓Host zoo for white tigers. White tigers born to normal coloured parents in 1980.
- ✓First captive breeding centre for endangered Gharials (1980).
- ✓A unique White tiger safari established on 1st October 1991
- ✓Wonderful site for wildlife conservation and education – integration of *ex-situ* and *in-situ* conservation (free living birds - 65 spp.; reptiles – 15 spp. mammals – 13, butterflies – 85 spp., fish – 46 spp. & prawn – 3 spp.).
- ✓Kanjia Lake – A wetland of National importance (2006).
- ✓Conservation Breeding Centres for Indian Pangolin and White backed vultures.

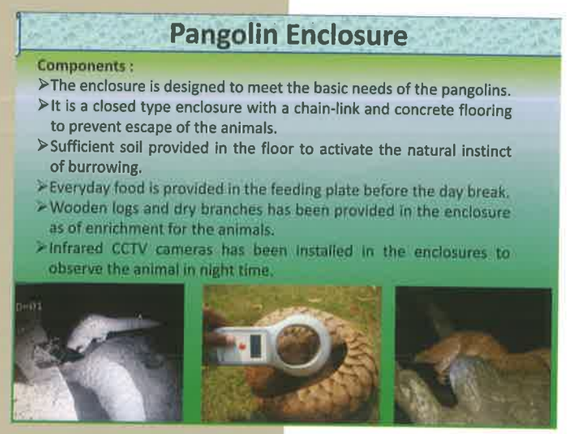
UNIQUENESS OF NANDANKANAN(Contd...)

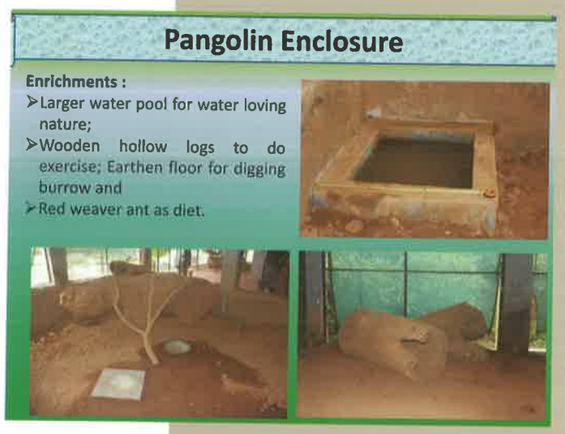
- ✓Largest pools for housing Gharials and Hippopotamus.
- ✓Second largest heronry for open billed storks (more than12,000) in Orissa.
- ✓Situated inside a natural forest of semi-ever green and moist deciduous nature (424 spp. of plants) Captive Fodder farm (over 33 Acs.)& Slaughter house
- ✓First zoo in the country to become member of World Association of Zoos & Aquarium (WAZA).

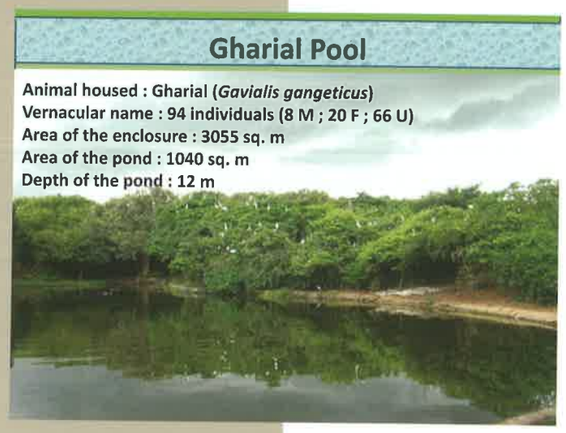
UNIQUENESS OF NANDANKANAN

- ➢Only zoo in India to house Eastern Rosella and Open-billed Stork
- ➢One of the two zoos in India to have Orang-utan, Spotted munia, Burmese python and Indian Pangolin
- ➢One among the three zoos in India for displaying Green-winged macaw, Cenerous Vulture and Nicobar Pigeon.
- ➢Nandankanan has been recognized by Central Zoo Authority (CZA) for Conservation breeding of tigers, Indian pangolins, white-backed vultures and Mouse deer.


Pangolin Enclosure
This is a closed type enclosure of a dimension of 15 ft X 15 ft X 10 ft (Established in 2009)


Pangolin Enclosure
Components :
➢The enclosure is designed to meet the basic needs of the pangolins.
➢It is a closed type enclosure with a chain-link and concrete flooring to prevent escape of the animals.
➢Sufficient soil provided in the floor to activate the natural instinct of burrowing.
➢Everyday food is provided in the feeding plate before the day break.
➢Wooden logs and dry branches has been provided in the enclosure as of enrichment for the animals.
➢Infrared CCTV cameras has been installed in the enclosures to observe the animal in night time.

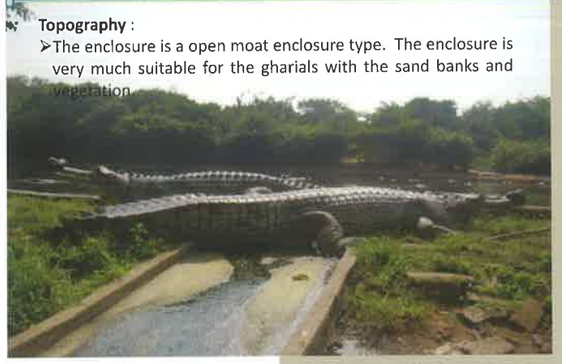

Pangolin Enclosure
Enrichments :
➢Larger water pool for water loving nature;
➢Wooden hollow logs to do exercise; Earthen floor for digging burrow and
➢Red weaver ant as diet.


Gharial Pool
Animal housed : Gharial (*Gavialis gangeticus*)
Vernacular name : 94 individuals (8 M ; 20 F ; 66 U)
Area of the enclosure : 3055 sq. m
Area of the pond : 1040 sq. m
Depth of the pond : 12 m

Gharial Pool

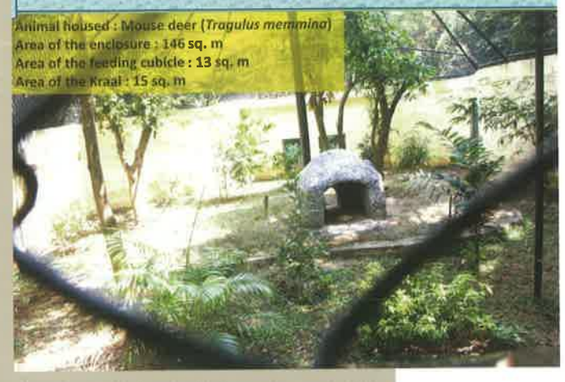
Topography :

- The enclosure is a open moat enclosure type. The enclosure is very much suitable for the gharials with the sand banks and vegetation.



Mouse deer Enclosure

Animal housed : Mouse deer (*Tragulus memmina*)
Area of the enclosure : 146 sq. m
Area of the feeding cubicle : 13 sq. m
Area of the Kraal : 15 sq. m



Mouse deer Enclosure

Components :

- The enclosure is a closed type enclosure.
- The substrate of the exhibit enclosure is the clay soil with grass topped. There is a feeding platform cum resting area in the center of the enclosure.
- The feeding cubicle and the exhibit area are well furnished to make it snake proof.
- In the back side of the feeding cubicle there is a kraal to separate the animal when ever necessary.

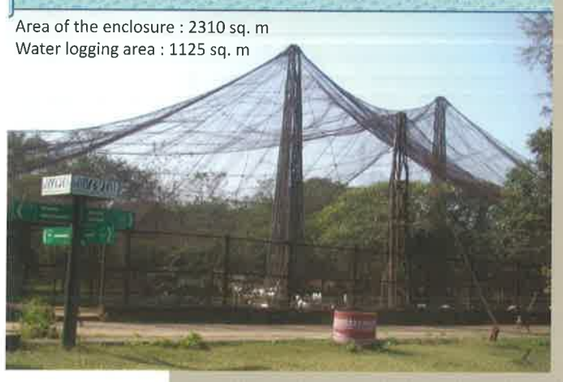
Mouse deer Enclosure

Enrichments :

- The enclosure is enriched with various trees and bushes.
- As the animal is very shy and secretive in nature, it needs the bushes for hiding.
- In the middle of the enclosure , there is a feeding platform which reduces the probability of infection from soil nematodes.

Aquatic Aviary

Area of the enclosure : 2310 sq. m
Water logging area : 1125 sq. m



Aquatic Aviary

No. of species housed : Eleven species
Total population of various birds : 139 nos.

Aquatic Aviary

Components :

- **The enclosure is covered with a net to prevent escape of the birds.**
- **There is a larger water pool for the aquatic birds.**
- **The large trees inside the enclosure is providing an appropriate habitat for the birds for roosting and nesting.**
- **There is also a feeding platform for the birds.**

Aquatic Aviary

Enrichments :

- It has a large water pool for the aquatic birds to meet their physiological needs.
- The large trees planted inside the enclosure are the suitable habitat for the birds for roosting and nesting.
- Additional nesting materials are being given to ease their nesting requirements.

Hippo Enclosure

Total Area : 6240 sq m
Feeding Cubicle : 77.4 sq m
Area of Kraal : 801.3 sq. m

Hippo Enclosure

Components :

- The enclosure is a open moat type.
- There is a large water logging area for the hippos.
- There is also a feeding platform for supplying fodder to the animals.
- Besides, there is a feeding cubicle and a small kraal adjacent to the feeding cubicle.

Hippo Enclosure

Enrichments :

- The large water logging area in the enclosure provides natural habitat for the hippos.
- There are also land area with larger trees near and outside the feeding cubicle which provides shadow to the animals.
- Food is provided in different places so that that will enhance the explorative behaviour of the animals.

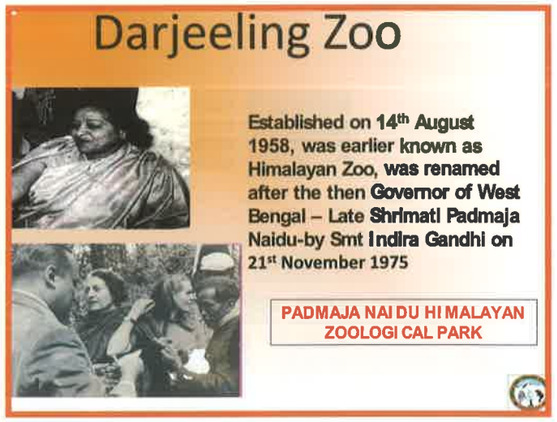
THANK YOU

Sharing Experiences on Landscapes and Zoo designing
Speaker : Dr. AK Zha, Padmaja Naidu Himalayan zoological Park, Darjeeling

Mr. AK Jha IFS, Padmaja Naidu Himalayan zoological Park, Darjeeling gave detailed description of park with objectives of the zoo, collection plan, conservation breeding of many endangered Himalayan species, conservation education and gave details of 5 best enclosures with strengths and weaknesses of the park.

Sharing Experiences on Landscapes and Zoo designing
- Padmaja Naidu Zoo, Darjeeling

- by AK Zha



- The Park has 80 % area under forest cover, representing the original forest composition of Darjeeling.
- More than 75 species of orchids have been planted on these trees , to make it a treasure of orchid gene pool.
- The Park is No Smoking and plastic free area.
- Regular visitor feed back is taken to improve the loop holes in the Park.
- The zoo markets the handicrafts made by villagers, employs them as guides-deeper association

Collection Plan

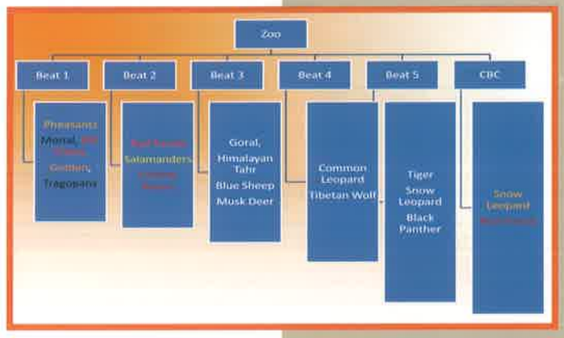
1. Snow Leopard
2. Common Leopard
3. Clouded Leopard
4. Royal Bengal Tiger
5. Red Panda
6. Blue Sheep
7. Himalayan Tahr
8. Goral
9. Barking Deer
10. Sambhar Deer
11. Musk Deer
12. Serow
13. Asiatic Black bear

1. Monal Pheasant
2. Kaleej Pheasant
3. Red Jungle Fowl
4. Grey Peacock Pheasant
5. Lady Amherst Pheasant
6. Golden Pheasant
7. Silver Pheasant
8. Himalayan Salamander
9. Himalayan Black Bear
10. Cheer Pheasant
11. Satyr Tragopans
12. Temminck's Tragopan
13. Blood Pheasant

Objects of the Zoo

Primary objective of management----

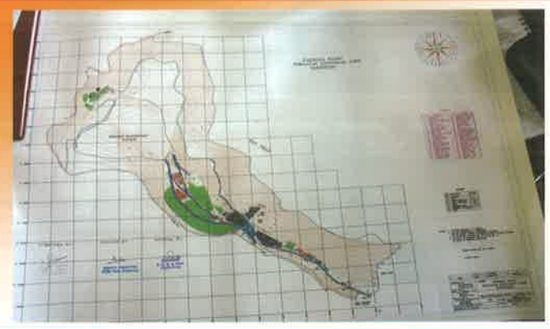
- Ex situ conservation and Captive breeding of animal species.
- Educating ,motivating, and initiating awareness campaign among the local people as well as visitors on the importance of conservation of ecosystem; conservation awareness, wildlife education, interpretation Programme with help from society and individuals.
- Initiating applied research on animal biology, behaviour and health care.
- Provide facility for health care of wild animals.



1.The Zoo has been located on a hill; and has been designed in the form of a food web, with Tiger occupying top most enclosure and, herbivores down below

2. The basic design of the park has been retained since 1958, with minimal change in lay out. The enclosures, night shelters "merge" in the overall ambience and environment , and are not eye sore . The colour, texture and the position of the enclosures and night shelters , merge with overall ambience of the park.

3. The construction have been kept to minimum , all along the contour to retain the overall hill lay out. Even enclosure height is as per contour



Asiatic Black Bear

Asiatic Black Bear

Six Cell for Night Shelter	Open ENCLOSURE
Length :9.50m Breadth:1.80m Height:4.50 m	Area: 1478.05 Sqm. Length:51.4 m Breadth: 28.7 m

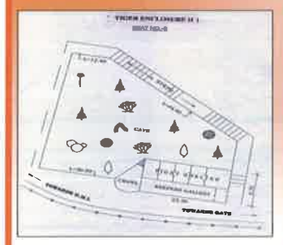
- **Floral Diversity**—No trees, mainly herbs and small shrubs
- **Enrichment**—
- Raised area for bear **to climb made from** dead trunks/ planks **Eg. Aerial walk ways,** climbing frames and **platforms.**
- Water ponds to **enjoy wading and bathing.**
- Artificial caves to **provide shade**
- Skylight in roof **to provide natural sunlight** and warmth in **doors**
- Pile of logs or rocks **for a keeper to hide** food in.
- Hiding food around **the enclosure**
- Bedding and nesting **material**
- **It is** a big open air enclosure with u- shaped **dry** moat (8 feet deep and 10 feet wide).. The keeper's gallery is 12.30m long.

- **Asiatic Black bear house: Beat 2**
- It is a big open air enclosure with u- shaped dry moat (8 feet deep and 10 feet wide).
- Each cell measure 4.45m X 1.75 m. Provided with feeding trough, high beds and proper ventilations on roof.
- The total breadth of the night shelter is 9.45 m.
- The keeper's gallery is 12.30m long.
- The enclosure is on the spur south as well as north facing slopes providing good escape area to the animal. Devoid of any big vegetation but provided with dry logs, water pond and other furniture.
- The newly constructed night shelter is on the top with six number of night cells. A keeper's gallery has also been provided.
- Behind the night cells a long verandah has been provided for the animal and also a pathway towards the enclosure. Skylights and proper ventilation have been provided in each cell for proper aeration and adequate sunlight
- One side of the enclosure, on the road going towards CBC, has been kept closed to visitors, to provide privacy to Bears.
- Caves , Dens, and enrichments provided in the enclosure

Asiatic Black bear

TREE SPECIES	NUMBER OF TREES IN ENCLOSURE	SPECIES OF SHRUBS IN THE ENCLOSURE
Acer laevigatum (Putli)	12	Hydrocotyle javanica
Eurya acuminata (Jhingni)	6	Eupatorium adenophorum
Ficus nemoralis (Dudila)	7	Erigeron bellidioides
Pieris ovalifolia (Angeri)	3	Gnaphalium luteo-album
Bucklandia populnea (Pipli)	8	Plantago major
Maesa chisia (Bilaune)	6	Polygonum nunchatum
ALL TREES INDICATED ABOVE ARE ,HOWEVER, YOUNG ,PLANTED 3-4 YEARS AGO		Astible rivularis Urtica dioca
		Rubus ellipticus
		Trifolium repens
		Rumex nepalensis
		Oxalis corniculata
		Lesanthus sp
		Pilea umbrosa
		Pauzolzia hirta

Royal Bengal Tiger



Royal Bengal tiger

Enrichment

- Rocks and logs behind which animals can hide from cage mates including caves.
- Trees, branches and ropes provided to rub on and/ or scratch
- Wooden raised platforms provided in the enclosures.
- Natural vegetation.
- Provision of ropes, dry rotten woods, wooden blocks for the animals to manipulate it.
- Odours of other animals (e.g. faeces of herbivores for carnivores to respond to) including logs , twigs or branches from the herbivore enclosures .
- Varying microclimates: temperature gradients, shaded and sunny areas etc- allowing animals to move to an area which is at a comfortable temperature at a particular time.
- Providing access to different areas, e.g. access during the daytime to holding pens/night accommodation in addition to the main enclosure.
- Providing objects (toys) which animals can interact with.
- Adapting feeding methods to increase food handling times (whole food which require manipulation prior to eating).

Royal Bengal Tiger

TREE SPECIES	NUMBER OF TREES IN THE ENCLOSURE	SPECIES OF SHRUBS IN THE ENCLOSURE
Acer laevigatum (Putli)	4	*Astible rivularis*
Ficus nemoralis (Dudila)	6	*Urtica dioca*
Alnus nepalensis (Utis)	2	*Rubus ellipticus*
Glochidion acuminatum (lathikath)	4	*Hydrocotyle javanica*
Quercus lamellose (Bak)	2	*Gnaphalium luteo-album*
Ilex dikhimensis (hare.Lise)	2	*Plantago major*
Debregesia febrifuga (Tusare)	1	*Polygonum runcinatum*
Quercus fenestrate (Arkawla)	2	*Pilea umbrosa*
		Pauzolzia hirta

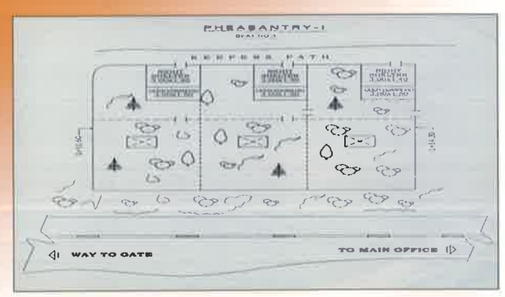
Royal Bengal Tiger

- Hanging Gates from top to avoid rusting
- Covered Ventilation on top for proper air circulation
- Clean feeding and drinking water bowls
- Wooden platforms for rest
- Curtains during winters as safety from Cold Air

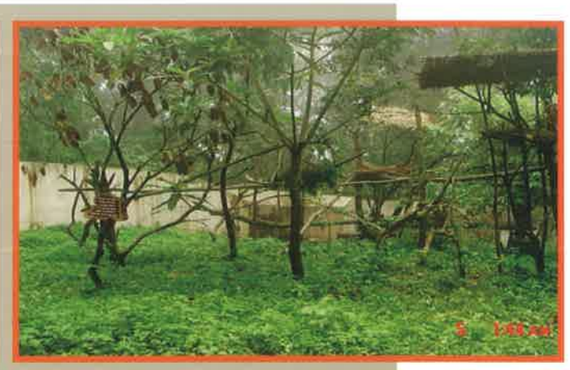
Pheasantry

- The pheasantry was reconstructed in the year 2000-2001. There are three pens with one CC cell each in the back with open verandah. The front has been provided with non- breakable transparent fibre glass (Polycarbonate) to give clear view to the visitors. It also acts as good wind breaker and save the birds and pheasants from teasing and noise pollution. The top and sides have been provided with ½ inch mesh chain link.

  Even the floor has also been provided with chain link (6-8 inches below the ground level) to protect the pheasantry from rats and other predators. The pens have recently been divided from the middle for segregation of the pairs for controlled breeding. All the sections have been provided with wooden nesting boxes. The entire pheasantry has been enriched by planting low height trees, shrubs, herbs and small bamboos. The gradient is almost flat.



Red Panda



- **Red Panda Enclosure: II: Beat 2**
- These are sufficiently large open aired enclosures with plenty of trees and greenary. The enclosures have been provided with 6-7 ft high RCC dry moat walls. Both the enclosures have been provided with one 2.15 m X 2.10 m cell each. The keeper's gallery (3.0m X 2.10 m) is shared by the both enclosures. Routine maintenance is done from the back. Both the enclosures are connected by a gate. Absence of slopes in enclosure No II but undulating topography in enclosure III. Sufficient furnishing and nesting boxes provided in both the enclosures

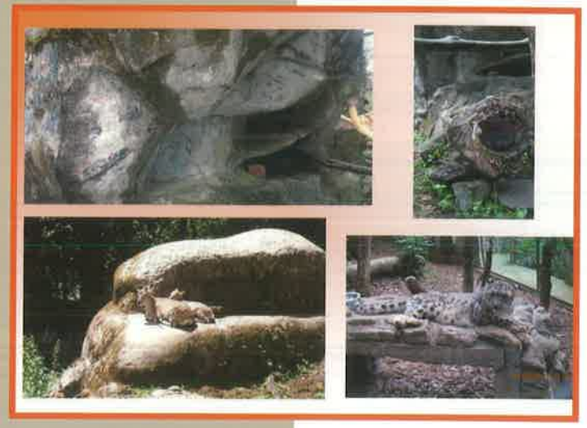
- **Red Panda Enclosure I: Beat 2**
- Rectangular to oval shaped enclosure with 7 ft high RCC wall on all four sides 1056 sq mt for two animals,are with a single night shelter (2.15 X2.20 m)on the back side. A small keeper's gallery has also been attached to the animal house. Nesting boxes are provided in the enclosure. 4-5 trees of medium height are growing in the enclosure which provides sufficient perching to the animals. Viewing is only from the front side where moat height is about 3 feet on the viewer's side because of the raised footpath.

Saurauia nepaulensis	4
Ficus nemoralis	1
Macaranga pattulata	1
Cryptomeria japonica	1
Eriobotrya petiolata	2
Eurya acuminate	1
Urtica dioca	
Rumex nepalensis	
Cynodon sp	
Erigeron bellidiodes	
Poa sp	
Trifolium repens	
Oxalis corniculata	

Eurya acuminate (Jhingni)	3
Acer laevigatum (Patli)	4
Machilus edulis (Lapcha kawla)	1
Michelia cathcartii (Tita champ)	1
Eriobotrya petiolata (Maya)	3
Castanopsis hystrix (Katus)	4
Beilschmiedia sikkimensis (Tarsing)	1
Prunus cerasoides (Paiyun)	1
Glochidion acuminatum (Latikath)	1
Rhododendron arboretum (Gurans)	2
Bucklandia populnea (Pipli)	1
Pentapanax leschenaultia (Chinde)	2
Symplocos theifolia (Kharane)	4
Hovenia dulcis (Bangkath)	1

Polygonum molaccanus
Centrum aurantiacum
Dichroa febrifuga
Astilbe rivularis
Rubus calycinus
Urtica dioca
Rubus ellipticus
Hypericum patulum
Eupatorium odemophorum
Pouzolzia hirta
Elatostema sp
Hypoestis sp
Hydrocotyle javanica
Viola serpens
Gnaphalium luteo-album
Erigeron bellidiodes

- The enrichment is changed every two months by keepers ,on Thursdays, voluntarily by rearranging, realigning , and reintroducing new items
- Change of fodder placements, food hiding,change of nesting boxes food timings
- Providing UV ray lights near enclosures during rains to kill insects
- Burning of turmeric powder for its anti bacterial activity
- Change of food timings for carnivores—very little options for food variation, whole caracass provided



Day 3 - November 4, 2011

Technical Session 4(contd)

Designing of enclosures and animal perspective
Speaker : B.C Choudhary, Wildlife Institute if India, Dehradun

The presentation of Mr. B.C. Choudhary "Designing of enclosures and animal perspective" was focused on designing & landscape planning on the basis of Taxonomic, geographic, ecosystem, climatic, vegetation etc., and gave clear cut on enclosure & exhibit and strengthened the landscaping from an animal perspective, simultaneously habitat enrichment.

Designing Enclosures from Animal Perspectives

- by B.C Choudhary

Landscape Planning and Zoo Designing:

DESIGNING ENCLOSURES FROM ANIMAL PERSPECTIVE

by
B. C. Choudhury
Wildlife Institute of India
Dehradun
E-mail: bcc@wii.gov.in

Depending on the site chosen for the zoo, it's geomorphology and other abiotic & biotic features and the collection plan conceived, enclosures for each exhibit can be planned and landscaped that is normally reflected in the layout master plan

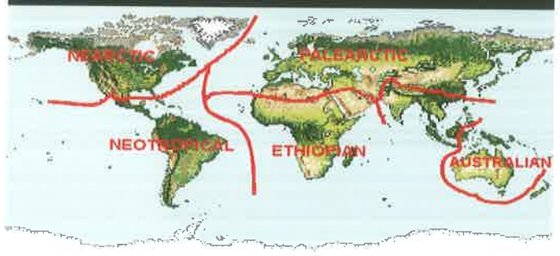
Kinds of features available in a zoo site for landscape and enclosure planning

a) Grassy meadows
b) Aquatic and marshy areas
c) Elevated and undulating grounds
d) Open landscape
e) Wild vegetated areas
f) Old growths
g) Others areas requiring restoration

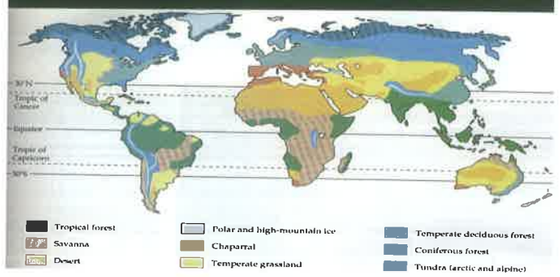
Enclosure design and landscaping is also influenced by the kind of overall exhibit theme of the zoo, such as:

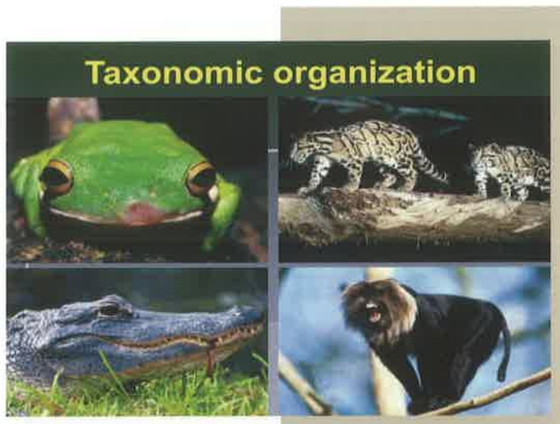
a) Zoological classification based
b) Continental representations
c) Habitat themes (e.g. Rainforest, deserts, savannah)
d) Predator – prey themes
e) Zoo-geographical realm
f) Specialist animal theme (e.g. Snake park, Walk-in-aviary, Birds-of-Prey)

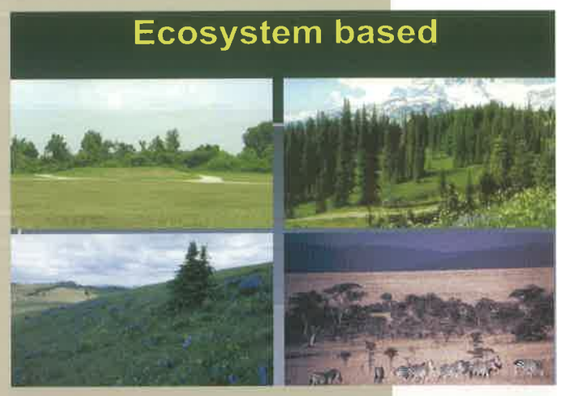
Zoo geographic organization

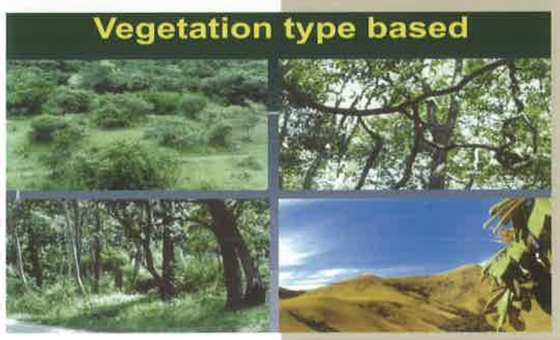


Bioclimatic organization (Biomes)









Enclosures in the context of a Zoo

A zoo is the some total of number of animal enclosures designed and landscaped in a manner that facilitates satisfactory viewing of exhibits without compromising the critical habitat and behavioral requirements of the animals life history parameters.

Objectives of enclosure creation

a) for exhibiting the animal
b) for conservation breeding
c) for exhibit as well as surplus stock creation
d) Quarantine
e) Commercial purpose (farming / aviculture)

"Enclosures" and "Exhibits"

"Exhibits"	"Enclosures"
There is a Context, Content and Message in design and placement	Only Content, not placed in any Context, and no message intended
Presentable form is an "Exhibit"	"Enclosures" are simple confinements
Take into account Animal, Keeper and Visitor needs	Only Animal and Keeper needs are considered while designing

All exhibits are "enclosures"
but not all enclosures are "exhibits"

While designing an exhibit....

..... Always remember to ask the following questions

1. What is the context ? (exhibit scenario)
2. What is the content ? (composition)
3. What is the message ? (education)

1. CONTEXT

It is the perceived environment surrounding the exhibit, viewer, including people, animal areas, interpretive displays.....

2. CONTENT

Exhibit details, specific to the enclosure of the animal in question, Stream (if necessary), wooden logs, type of night shelter, Den/Drey (if necessary), Trees/shrubs (& their protection)

3. MESSAGE

What is the message you want to convey. A good exhibit is the education of the first order. A bad exhibit and good graphics do not go together.

Theme

Modern zoos should be built on a concept or theme.

Theme could be global, national, regional or even mythological

Global: National Zoo, Delhi
Regional: Coimbatore Zoo
Mythological: Tirupathy Zoo

Organization

Within the overall theme, animals have to be distributed based on an Organization concept

Bioclimatic zones
Zoogeographic areas
Taxonomic affinity
Vegetation types

Exhibit SEQUENCING is very important .....

..... while dealing with immersion exhibits

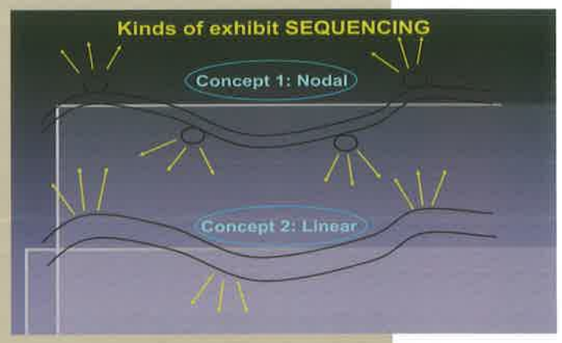
..... when the scenario contains many species

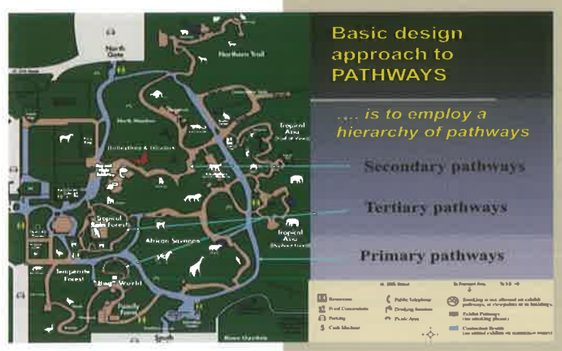
A proper flow of visitor CIRCULATION is the key

Because .....

..... circulation system controls and influences what the visitor perceives

..... the circulation system is the basis along which the "story line" is developed





landscaping from an animal perspective and the primary consideration needs to enhance the exhibits:

a)Diurnal / Nocturnal range of activity spectrum
b) Providing enrichment infrastructure that meets the critical life-history parameter requirements of the target animal, minimizing the novelty factor
c) Safety and protection from visitor vandalism and also animal escape
d) Enhances the exhibit value for satisfactory viewing

Target Taxon (Amphibians)
Basic critical consideration for designing and Landscaping is to provide the following

a) Static and flowing water as the taxon group is totally aquatic, egg laying and larval stages in water gradually metamorphosed to a land animal
b) Land and aquatic edge vegetation that helps cover, camouflage and forage (insect) value
c) Visitor understand them as animal of aquatic habitat

Target Taxon (Reptiles)

a) Ecto-thermic – approximating body temperature with ambient temperature
b) Behavioral thermoregulation -mosaic of sunlight and shade that also helps these cryptic and elusive creatures
c) Ratio of aquatic and land area (for basking, nesting and retreat from intruding visitor)
d) Opportunities for 'victims' of territorial antagonism for escaping into sub-territories

Target Taxon (Mega-herbivores Elephants, Rhino, Gaur and other large herbivores)

a) Large tress that provide shade as they tend to be susceptible to fluctuating temperature profile
b) Landscaped to create sub-territories for minimizing antagonism
c) Camouflaged but affective dry or wet moat to enhance visibility value

Target Taxon (Herd Ungulates – Antelopes and Deer)

a) Undulating meadows for facilitating grazing, breeding and courtship display
b) Providing cover vegetation for fawns
c) Browse species with browse-line maintenance
Creation of static and flowing water-bodies for wallowing and other courtship

Target Taxon (Lesser cats and other canids: Wolf, fox, Leopard-cat, Golden cat)

Being crepuscular/nocturnal, they are often inactive during visitor hours hence require special attention for design/landscaping that creates areas of stimulated dusk and dawn situations where they retreat
Optimal sized enclosure that provides opportunity to prevent stereotypic activity
Provisioning of dens cavities and such other facilities not compromising their visibility aspect to visitor

Target Taxon (Large cats)

Specific to species of different habitat preference
Leopard / Clouded Leopard: Escape proof but naturalistic as they tend to climb trees
Snow Leopard: only high altitude zoos that do not require artificial cooling mechanism
Lion: Open stimulated savannah habitat that provides for prides to be exhibited
Tigers: territorial aspects to be considered and provisioning of adequate sunlight/shade and water as well as retreat cover

Target Taxon (Bears)

Dens for retreat landscaped to merge with the background
Foraging behavior reflecting landscaped such as artificial ant hills, hidden feeding areas
Climbing trees & perches for Black Bears and Sun bears

Target Taxon (Primates)

Arboreal, Canopy obligate animals. Require and enclosure landscape that provides provisioning of trees with branches that provide opportunity for brachiating, bedding and foraging

More details are from the WII study presented by Mr. P. C. Tyagi

Target Taxon (Avifauna)

Bird-of-Prey: Tall enclosures with long flight aviaries
Parrot Medium-height, strong-meshed enclosures with long flight and several strong perches of natural vegetation
Waterfowl: Low-height, Shallow pool with long aviaries with natural earthen mounds
Galliformes: Non-cemented, medium sized, long flight with ample tree cover
Softbills (Myna, hornbill etc.): Medium-sized, planted long flight aviaries and nesting cavities

Target Taxon: Critically Endangered species for conservation breeding enclosure design and landscaping

Minimizing human imprinting
Minimizing antagonizing and territoriality
Providing and approximating and stimulating the species wild habitat
Enrichment practiced in away that deters stereotypic behavior

THANK YOU

Visit to the Nehru Zoological Park

Discussions outdoors

Participants presenting

Group Recommendations by 6 Groups

During the visit to the Nehru Zoological Park on Day 3 of the Workshop, the Participants of the Workshop were divided into Groups and were given an assignment based on the Nehru Zoological Park. The Groups completed their assignment and gave their recommendations under the overall supervision of Sri BS Bonal, MS, CZA & SK Patnaik and presented them to the audience.
The Groups formed were as follows:
Group-A (Carnivores & Small Mammals)
Group-B (Reptiles & Amphibians)
Group-C (Herbivores)
Group-D (Birds)
Group-E (Primates)
Group-F (Ursids/Bears)
The recommedations presented are given ahead.

Group - A (Carnivores & Small Mammals)

Subject: ***Detailing of parameters for Landscaping and Enclosure designing in different sites/ landscape***
Species: ***Lion and Tiger***
Site: ***Lion Enclosure Hyderabad Zoo***
Facilitator: **Mr. Jon Coe, Australia**

Group members: **1) A. M. Anjankar, Mumbai Zoo**
2) Dr. R. V. Jadhav, Pune Zoo
3) Dr. Mehta, Surat Zoo
4) Dr. Dubey, Bhilai Zoo
5) D.N.F. Carvhalo, Bondla Zoo
6) Dr. Naikawade, Aurangabad Zoo

Recommendations:
1. Proposed dimensions for indoor night shelter for the animals should not be more than 4 x 4 x 3 metres – for new zoos.

2. Kraal area: 10 x 4 x 3 (height) m. 50% top to be closed and 50% top with chainlink.
3. Keeper Gallery: Width - 3m, Height - 3m, Length - depending upon no. of cells.
4. Nursery area for pregnant animals of suitable dimensions is proposed.
5. Outdoor area exhibit – As per CZA's existing guidelines.
6. Lion exhibit area scenario was naturalistic. The viewers side should also be developed as naturalistic to have landscape immersion effect.
7. The alignment of moat, pathway, stand off barrier should be asymmetrical i.e. in Zig-Zag manner.
8. The Rock work should not be colored.
9. The Rock work should be at barest minimum and should be hidden with curtain keepers with mixed vegetation.
   -No Ornamental plants should be planted in and around enclosure area.
   -Forestry vegetation should be planted within stand off barrier.
   -Avoid 'Y' section in visitor circulation plan.
   -Standoff barrier should be maintained properly to avoid injuries to visitors.
   -The pathways should be dust free, look natural with proper substrate.
   -Avoid paver blocks or tiles.
   -Instead of continuous viewing area, provide interrupted areas.
   -Camouflage holding cages properly.
10. The rock work should not start from the stand off barrier considering animal and visitor safety.
11. Avoid hanged iron weights of door pulley to Prevent head injuries to keeper.
12. Provide cross ventilation.
13. Appropriate enrichment.

Group - B (Reptiles & Amphibians)

Subject: Reptiles & Amphibeans
Species: Gharial - *Gavialis gangeticus*

Facilitators:
1. Shri BC Choudhary, Scientist, Wildlife Institute of India, Dehradun & Asia Chair IUCN/SSC Crocodile Specialist Group
2. Dr Brij Kishor Gupta, Evaluation & Monitoring Officer, Central Zoo Authority

Participants
1. Shri KSSVP Reddy, Director, Arignar Anna Zoological Park, Vandalur
2. Shri AK Jha, Director, Padmaja Naidu Himalayan Zoological Park, Darjeeling
3. Dr S Panda, Director, Nandankana Zoological Park, Bhubaneshwar
4. Shri. Amitabh Agnihotri, Director, National Zoological Park, Delhi
5. Shri Basanta Rajkumar, Director, M.C. Zoological Park, Chhatbir
6. Shri Abhay Kumar, Director, Sanjay Gandhi Biological Park, Patna

Improvement suggested for existing excnsloures
1. Only 1/3 area to be opened for public viewing
2. Provision of san bar on distal side

Group members studying the existing enclosure site at Nehru Zoological Park, Hyderabad

3. Improvement/modification of stand-off barrier
4. Improvement of Sex ratio (Present 0:12)
5. Planting of bushes, vegetation on distal side for breeding, hiding
6. Marking of animals.

Recommendations

1. Enclosure should have simulated appearance of natural riverine pool with high rise sandbanks.
2. The paddock area for the animals should be of at least 1500 sqm (2:5) with 25% of water body, with 10% high rise sand banks.
3. The depth of water body should be at least 3 m with saucer shape pool. The water body should have appropriate provision of inlet and outlet.
4. Only 1/3 area of the total periphery of the exhibit should be opened for public viewing.
5. Multiple viewing should be provided, with view breaks.
6. Provision of sand banking on distal side should be provided. It should be made in such manner that sand bank get morning and evening sun lights therefore two mounds are required to attract the animals to climb to sand banks and gain visitors' attraction too.
7. The zoo should maintain appropriate male : female sex ratio.
8. Planting of bushes, vegetation on distal side for breeding, hiding of the animals should be provided.
9. Marking of animals should be made mandatory.
10. Fluctuating water level and high rise sand banks.
11. Water topping is required by surface flowing. Twice a year the whole water should be changed.
12. Provide access for one inlet and one outlet in the water body.
13. The barrier wall should be made of boulder wall/RR masonry or using local material, 18" thickness. The height of the moat wall should be at least 2m with dry moat (gentle).
14. Provide access gate for keeper/maintenance with removable panel of 6' height x 4' width, single gate should be provided at an appropriate place.
15. Preferably live fish feeding should be made once a day.
16. Minimum two keepers should be allowed to enter the exhibit during maintenance and feeding of the animals.
17. The zoo should provide the off exhibit holding/isolation yard of the size of 300-500 sq feet with 50% area as water body.

MESSAGE:

Role of Gharial in Riverine Ecosystem and their Conservation.

Group - C (Herbivores)

Subject: Hog Deer Enclosure Design, at Nehru Zoological Park, Hyderabad
Species: Herbivores
Facilitator : Shri RS Bhadauria, IFS

Members of the Group
1. Shri K Praveen Rao, Director, Kanpur Zoological Park, Kanpur, UP
2. Shri Ajay Gupta, Director, Jaipur Zoo, Rajasthan
3. Dr Ajay Biswas, Director, IG Park Zoo, Rourkela, Orissa
4. Shri Sarvanan, Curator, Sri Venkateshwara Zoo, Thirupathi, AP
5. Dr Sunil S Bawaskar, officer–in–charge, Maharaj bag Zoo, Nagpur
6. Shri K Sheker Reddy, ACF, Sri Venkateshwara Zoo, Thirupathi, AP

Enclosure Facts
1. Exhibit area – 50m x 40m
2. Two sides by chain link and other two sides by moat
3. On one side of the moat railway track and main pathway- Primary pathway
4. On one side loop road – secondary pathway
5. Barrier is dry moat of sufficient width and height. Moat V shaped
6. All along the moat stand-off barrier present of 2.5 ft height with live hedge
7. Restraining cells 7 nos, size 2 m x 3 m covered by corrugated sheets and sides by chainlink mesh
8. Two kraals in between cells and paddock. Kraals of the size 10m X 5 m other 10 m x 3m
9. Feed concentrate in the cubicles
10. Green fodder in the exhibit area

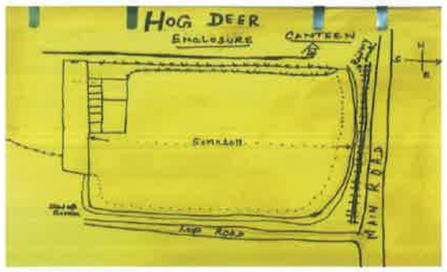
11. Water provided both inside and outside.
12. Present population 3 : 6

Recommondations - Paddock

1. Drinking water trough of 1m x 3m
2. Collect the overflow in a wallowing tank of size 10m x 10m, to be lined by clay. Supplement water if necessary.
3. The dry moat has seepage water, so the problem can be addressed by filling it up to the water mark created by flooding even then the moat wall be safe enough.
4. Non palatable shrubs to be planted to provide place for hiding.
5. The chain link mesh towards canteen to have green belt/creeper to avoid visitors seeing from all sides.
6. The viewing side from railway to be as such.
7. The other side to be divided by green bushes into two.
8. The stand off barrier needs welded mesh for protect green hedge from tampering
9. The south-eastern side adjoining house to be covered by green belt and wing should not be allowed.

Recommondations - House

1. Kraal should be covered with chain link mesh
2. The keepers gallery to be modified in such a way that it provides service to the cubicles and direct access in to the paddock



Group - D (Birds)

Subject: Birds

Species: Painted stork **Site:** Painted stork, Nehru Zoological Park, Hyderabad

Facilitators:

1. Mr Bipul Chakraborthy (TATA Zoo)
2. RK Sahu Ahmedabad Zoological Garden

Group members:

1. Mr BJ Rana (Sakkarbaugh Zoo)
2. Thomas Varghese Dy. Director Chidiyatapu Zoo (Andaman)
3. Dr Heerpara (Rajkot Zoo)

Recommendations

1. Area- 450 Sqm i.e. 30m x 15m
2. Roof should be dome shaped
3. Compatible species to be displayed
4. View of area- limited to 20% only
5. Enclosures which have adjacent open areas - can use the same as small amphitheatre where visitors can sit and see the birds
6. Planting of species - preferred for the animals in the wild.
7. Nesting materials to be provided
8. Pool- 50% of the area, which should have shallow water
9. Keeper access - double door entry from back side of enclosures
10. Water filtration and re circulation
11. Perches and platforms to be provided for nesting place.

Group - E (Primates)

Subject: Primate Exhibit

Species: Lion Tailed Macaque
Facilitator: Shri PC Tyagi

Group members :

1. Shri Himanshu Malhotra
2. Shri PC Tyagi
3. Shri AK Bhowmmik
4. Shri MA Waheed
5. Shri Uttam Yadav
6. Shir BP Ravi
7. Shri Rahul Bhatnagar

Recommendations

1. **Enclosure surround :** A number of primate enclosures are located continguous to each other and cluttered . Enclosures surrounding of LTM needs to be improved by planting more tree and shrub species and creating a mystery element for visitors. The Landscape immersion values in non-exhibit public use area needs to be improved.

2. **Sight line & view of enclosure :** The visitor path is raised and moat become visible to visitors, hence, it is recommended that the path should be lowered and hedge raised and the stand off barriers fortified.

3. The U shaped wet moat is 5m in depth and 6m wide. The inner moat wall merges with the edge where grass occurs giving a natural look. The grass should not be cut and allowed to grow wild

5. **Visitors viewing area :** It is about 1/3 of the perimeter of the enclosure and is about 30 m long and presents a view of the enclosure from all angles. It is necessary that short trees and shrubs are planted to create three viewing gallery so that cross views and view of night shelter is obliterated.

6. The enrichment inside enclosure is inadequate, more logs to be placed for feeding enrichment.

7. **Animal Holding area:** The size of the feeding cubicle and the keepers gallery is as per the guidelines, however, feeding cubicle requires enrichment like ledges perches and climbing aids, raising the height of water trough and placing the feeding bowl at height of about 50cm and others close to the ledge is necessary.

8. Drainage to be covered.

9. Out of 6 feeding cubicles the central 2 should be merged to form social housing area with enrichment instead of keeping animals separately in cubicle.

10. Drainage to be covered.

11. The provision of skylight and elevated ledges may be considered for animal to view the landscape horizon.

12. **Feeding Enrichment:** Feed is given to animals in feeding cubicles. Food to be classified into wet and dry ration. The cooked food like rice gruel should be fed in feeding cubicle but the dry ration can be presented to animals inside the enclosure in innovative ways to encourage exploration of food.

Group- F (Ursids/Bears)

Species: Sloth bear

Site: Bear Enclosure Hyderabad Zoo

Facilitators: 1. Dr. Naim Akhtar, Scientific officer, CZA, New Delhi, 2. Roger Shermon (USA), 3. SC Sharma, Ex-Addl. DGF(WL) & Ex-Member Secretary, CZA, New Delhi

Group members: 1. Upendra Pachnanda(Jammu) 2. SD Badgaiya(Bilaspur) 3. Rakesh Chaturvedi (Raipur) 4. AK Patel(Geer), 5. G Ramalingam(Vishakhapatnam)

Recommendations

1. Remove hedge from the stand of barrier and plant natural grass and shrubs from both sides of pathways and create immersion type of landscape.
2. Add enrichment e.g. more physical elements required such as dead logs, etc.
3. Create different landscape in the enclosure such as mounds, dry land, and open and close canopy.
4. Animal holding area should be dismantled and reconstructed in order to provide more comfort to the animals with updated water, electrical, air and feeding facilities. Animal holding area should be constructed in such a way that it is cool in hot summer nights. Holding area should have squeeze cage facility. It should have proper resting platform above from the ground as animal defecate enormously. Holding area should be big enough and have proper ventilation.
5. Neighboring enclosure of black bear may be camouflaged.
6. Neighboring birds' enclosure should also be improved and camouflaged.
7. Viewing area may be reduced through planting some more vegetation, may have only 2-3 viewing area.
8. Screen side wall may be camouflaged with vegetation.
9. Termite mounds may be placed to increase the landscape value, complexity and behavior enrichment.
10. Wet moat is not required instead water pool may be created in the centre, should be visible to visitor.
11. Quantity of Dalia & bread should be decreased from the diet and increase quantity of seasonal fruits.
12. Providing ants and termites if possible may also be included in bear dietary regime.
13. The female should be keeping its newly born baby away from the public view at least for 2-3 weeks, so holding area should have den type mechanism to provide privacy.
14. Compatibility of bear should also be checked if more than one bears are being released into single release (outdoor) area of enclosure as cannibalism exist in bear species.

Day 4 - November 5, 2011

Technical Session 5

Introduction of Expert Group of Zoo Designing & Master Planning - by BS Bonal

In his presentation Mr. Bonal, IFS, gave an idea in developing long term master planning of zoo.

Master Planning for the long term development of the Zoos-Review

5th November, 2011

B. S. Bonal
Member Secretary
Central Zoo Authority

Schedule of Presentation

- Major Steps
  - Collection Plan
  - Master(lay out) Plan
  - Master Plan

MASTER PLANNING

(RZR,2009-10.3.1-9)

- **Master Plan**
- (RZR-10.3.1-5)
- 20 years with revision -10 years
  - Detail as per approved M(LO)P
  - Write as per guide lines and format
  - Should cover-Disaster plan, CB plan, Education Plan
  - Budget-Break up for 5 years as per work plan

MASTER PLANNING

(RZR,2009-10.3.1-9)

- **Collection Plan**

(RZR-10.3.6-9)

No acquisition if no facility available

CZA s decision binding for CBP(vulture From Jammu)

- Mother of Master planning
- Already finalized in consultation with zoo directors, managers, CWLW
- For indigenous sps

MASTER PLANNING

(RZR,2009-10.3.1-9

- **Master (Lay out) Plan**
- (RZR-10.3.1-5)
- 20 years with revision -10 years
  - Indicating enclosures(30%)
  - With colour code
  - Based on theme
  - Green belt, lawns, gardens,(30%)
  - Animal house(not exidng30%)
  - Parking, visitors facility, hospital, PM, Burial, CB site, RC site etc
  - M(LO)-for Electric, water, drainage, sewerage etc

MASTER PLANNING
(RZR,2009-10.3.1-9)

- **Master Plan**
- (RZR-10.3.1-5)

Procedure

- Draft MP received in CZA
- Sent to Members of Expert Group of Zoo Design
- Scrutinized
- Recommendation/suggestion sent to Directors ---? 3-4 times
- Field appraisal-by members(LZ,MZ,SZ)
- Re submitted MP- Scrutinized & Approved in Principal if Complied

MASTER PLANNING
(RZR,2009-10.3.1-9)—Contd.

- **Master Plan**
- (RZR-10.3.1-5)

Procedure

- Final MP received in CZA
- Should have detail-
- Prepared by with signature
- Signature of CWLW/Owner
- Than Counter Signed by MS,CZA
- Should have detail-Foreword, Preface, Directors desk, history, Acknowledgement, contents etc.
- Annexures,Appendix
- Part-I,Part-II etc

DESIGN

- Submit with
  - Site plan(not in scatch)
  - Indicate location ,terrain in approved M(LO)P
  - Follow basic norms eg

- Sub committee on Zoo Designing
- Expert Group on Zoo Design

Background
Constitution of Sub-committee on Zoo Design

Constituted on 28th July, 1999.

Main functions of the committee:

1. To scrutinize and suggest improvements/changes in the designs of enclosures submitted by various zoos.
2. To suggest standards/norms for designing of enclosures for various species.

Members:

- Shri R. S. Bhadauria, Retd. PCCF, UP (who later resigned due to personal reasons)
- Shri S. K. Patnaik, Retd. CWLW, Orissa
- Shri A. S. Dogra, Retd. CWLW, Punjab
- Shri T. Ramakrishna, Retd. CWLW, Andhra Pradesh
- Supdt. Engineer, CCU, MoEF, New Delhi
- Director, SPA, New Delhi
- Member Secretary, CZA

19 Meetings were held till 31/07/2007.

Background
Constitution of Sub-committee on Zoo Design

04.12.2007

1. Director, School of Planning & Architecture, New Delhi
2. Member Secretary, CZA
3. Prof. M. Shaheer, Head of the Department of Landscape Architecture of the School of Planning and Architecture
3. Prof. (Dr.) Rommel Mehta, SPA, New Delhi
4. Prof. (Dr.) Biswajit Bhattacharjee, IIT, New Delhi
5. Shri. S. K. Patnaik, Retd. CWLW, Orissa
6. Chief Engineer, CCU, MoEF and
7. Dr. Brij Kishor Gupta

Present structure of the Expert Group on Zoo Designing of the Central Zoo Authority

Sub-Group No.	Name of the Members	States allotted for Master Plan of the Zoos to be scrutinized
A	(i)Sh. S. C. Sharma (Coordinator) (ii)Prof. (Dr.) M. Shaheer (iii)Dr. Brij Kishor Gupta	Andhra Pradesh, Kerala, Karnataka, Tamil Nadu
B	(i)Sh. S. K. Patnaik (Coordinator) (ii)Prof. (Dr.) Rommel Mehta (iii)Sh. Kartick Satyanarayan	Uttar Pradesh, Gujarat, Uttarakhand, Jammu & Kashmir, Haryana, Bihar, Chhatisgarh, Jharkhand, Delhi, Punjab
C	(i)Sh. R. S. Bhadauria (Coordinator) (ii)Prof. (Dr.) Surinder Suneja (iii)Sh. Himanshu Malhotra	Arunachal Pradesh, Assam, Mizoram, Sikkim, Meghalaya, Tripura, West Bengal, Orissa, Nagaland, Manipur
D	(i)Sh. A. S. Dogra (Coordinator) (ii)Chief Engineer, CCU, MoEF (iii)Dr. A. K. Malhotra	Rajasthan, Goa, Madhya Pradesh, Andaman & Nicobar Islands, Himachal Pradesh, Dadra & Nagar Haveli, Maharashtra

Constitution of Expert Group on Zoo Design

The terms of reference of the Expert Group are:-

- To scrutinise, suggest improvements, changes and make recommendations (to the Technical Committee) in the proposed master (layout) plan & master plan submitted by the various Zoos.
- To scrutinise, suggest improvements/ changes and approve/ disapprove the designs of animal enclosures submitted by various Zoos.
- To suggest standards and norms for designing of animal enclosures for various Zoos vide this office order

Progress Report of the Master Plan Appraisal

	Group A	Group B	Group C	Group D
	Sh. S. C. Sharma Prof. (Dr.) M. Shaheer Dr. Brij Kishor Gupta	Sh. S. K. Patnaik Prof.) Rommel Mehta Sh. Kartick Satyanarayan	Sh. R. S. Bhadauria Prof. Surinder Suneja Sh. Himanshu Malhotra	Sh. A. S. Dogra Chief Engineer, CCU, MoEF Dr. A. K. Malhotra
Name of the State	Andhra Pradesh, Kerala, Karnataka, Tamil Nadu	Uttar Pradesh, Gujarat, Uttarakhand, Jammu & Kashmir, Haryana, Bihar, Chhatisgarh, Jharkhand, Delhi, Punjab	Arunachal Pradesh, Assam, Mizoram, Sikkim, Meghalaya, Tripura, West Bengal, Orissa, Nagaland, Manipur	Rajasthan, Goa, Madhya Pradesh, Andaman & Nicobar Islands, Himachal Pradesh, Dadra & Nagar Haveli, Maharashtra
Total No. of Zoos	53	44	42	32
No. of Zoos submitted Master Plan	47	34	37	25
Master Layout Plan Approved	11	9	11	12
Master Plan Approved	3	9	3	3

Constitution of Expert Group on Zoo Design

- 8 new members were inducted in the Expert Group on Zoo Designing on 28th May, 2010:
  - Shri S. C. Sharma, Retd, Addl. DGF (WL)
  - Shri R. S. Bhadauria, Retd. PCCF (WL), U.P.
  - Shri. A. S. Dogra, Retd. PCCF (WL), Punjab
  - Prof. (Dr.) Surinder Suneja, SPA, New Delhi
  - Shri Himanshu Malhotra, Film Maker from New Delhi
  - Dr. A. K. Malhotra, Retd. Curator (Education), NZP
  - Shri Kartick Satyanarayan, Member, CZA

CZA Rules and Guidelines on Master Planning

- by Dr Brij Kishore Gupta

The presentation of Dr. Gupta focused on guidelines and rules in development & planning of zoos and gave guidelines for submission of design of the animal enclosure to the CZA.

Central ZOO Authority
(Ministry of Environment & Forests)

Development & Planning of Zoos: Rules & Guidelines

Dr. Brij Kishor Gupta
Central Zoo Authority

Recognition of Zoo Rules, 2009

(Notified on 11th November, 2009)

1. **Every zoo shall prepare and get the master plan approved by the Central Zoo Authority.**
2. Zoos which are in operation at the time of the commencement of these rules, **shall prepare and get the master plans approved from the Central Zoo Authority within one year from the date of commencement of these rules.** .
3. The master plan referred to in sub-paragraphs (1) & (2), shall inter alia, include all round development of the zoo for a period of twenty years which shall be revised every ten years along with a detailed layout plan prepared on the basis of the theme adopted by the zoo, **indicating the locations of green belts, lawns, gardens, animal display area, visitor facilities, support infrastructure for animal upkeep and healthcare, buildings for administrative** and maintenance unit.

Recognition of Zoo Rules, 2009

(4) **Atleast 30% of the area earmarked for the zoo shall be kept under green belt and natural vegetation and the area for animal housing shall not exceed 30% area of the zoo.**

(5) Every zoo shall take adequate care to locate and design all *'pucca'* buildings including the visitor facilities in such a manner that the natural landscape of the zoo and animal enclosures are not masked and the cleanliness and hygiene of the zoo is not affected.

(6) Every zoo shall, in consultation with the Central Zoo Authority, prepare a collection plan indicating the names of the species and maximum number of animals of each species to be housed in the zoo, having due regard to the congeniality of the climatic conditions of the locality for the general health and well being of the species, availability of the space and infrastructural support for proper upkeep and healthcare of the species, proximity of the zoo to the habitat range of the species and the past record of the zoo in management and breeding of the species and no zoo shall compromise on housing and upkeep standards of animals for accommodating new species or additional animals of the species in its collection.

Recognition of Zoo Rules, 2009

(7) No zoo shall accept any rescued animal unless it has appropriately designed enclosure and upkeep facilities for the animal as well as the facilities for keeping it in isolation during quarantine period.

(8) Whenever any zoo decides to accept any rescued animal for housing, a detailed report regarding the source from which the animal has been received, legality of its acquisition and the facilities available at the zoo for housing, upkeep and healthcare shall be sent to the Chief Wildlife Warden of the State.

Provided that in case, the rescued animal pertains to an endangered species a copy of the report shall also be sent to the Central Zoo Authority.

(9) Any decision of the Central Zoo Authority about any animal being sent to a particular zoo for augmenting the number of founder animals for the conservation breeding programme of the species shall be binding on the concerned zoo.

- The final Master Plan for the long-term development of the zoo should be submitted to the Central Zoo Authority through and obtaining the concurrence of the Chief Wildlife Warden of the State/ Municipal Commissioner/ Zoo Controller along with the counter signature of the Chief Wildlife Warden/ Municipal Commissioner/ Zoo Controller and the Zoo Director.
- Mobilizing financial resources for the implementation of master plan shall be the responsibility of the respective zoo operator.
- The zoo operators shall strictly adhere with the approved master layout/master plan while taking up the development works.

--DO NOT SUBMIT DETAILED DESIGN OF PROPOSED ANIMAL ENCLOSURES WITH MASTER PLAN. THE SAME TO BE SUBMITTED ONCE MASTER PLAN APPROVED AND CASE TO CASE BASIS AT THE TIME OF EXECUTION.
--SUBMIT THE LAYOUT PLAN DULY SIGNED.
--DO NOT COPY FROM OTHER ZOOS.
--WATCH SPELLING MISTAKES OF ANIMAL NAMES AND THEIR SCIENTIFIC NAMES
--AVOID CUT PASTE OF INFORMATION AVAILABLE ON NET ELSE CREDIT THE SOURCE.

GUIDELINES FOR SUBMISSION OF DESIGN OF THE ANIMALS ENCLOSURE TO THE CENTRAL ZOO AUTHORITY.

- The design should be labeled by giving titles like plan, elevation, cross-section at the top. It should also include dimensions of entry doors/ sliding doors and windows.
- The design of the animal enclosure either proposed as a new or modification/ extension/ renovation should contain a copy of layout plan showing the location.
- The animal house should be preferably located outside the paddock area instead of protruding inside the animal enclosure.

GUIDELINES FOR SUBMISSION OF DESIGN OF THE ANIMALS ENCLOSURE TO THE CENTRAL ZOO AUTHORITY.

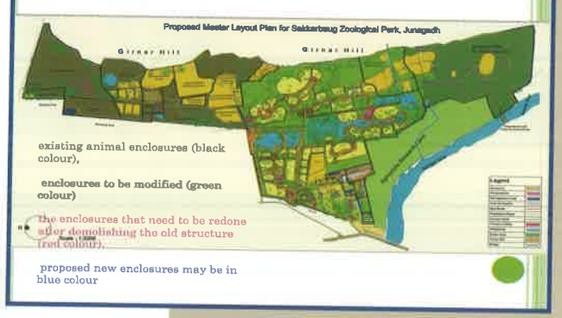
- The design submitted to the Central Zoo Authority preferably got prepared by a engineer/ structural engineer/ architect/ consultant providing cross-sections as the case may be and should have got approval and signature from the Director/ Officer-in-charge of the Zoo.
- The drawing should also indicate visitors' viewing area and the same should not be more than 25% of the total periphery.
- The dimensions of paddock and feeding retiring cells should be strictly followed as of the Central Zoo Authority.

GUIDELINES FOR SUBMISSION OF DESIGN OF THE ANIMALS ENCLOSURE TO THE CENTRAL ZOO AUTHORITY.

Whenever, the Central Zoo Authority's funds required for such works, the estimates should be prepared and submitted, once the design is approved by the Central Zoo Authority.

Three sets of the design should be submitted with signature of the zoo director for its scrutiny.

MODEL MASTER LAYOUT PLAN



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D	(i) Sh. A. S. Dogra (Coordinator) (ii) Chief Engineer, CCU, MoEF (iii) Dr. A. K. Malhotra	Rajasthan, Goa, Madhya Pradesh, Andaman & Nicobar Islands, Himachal Pradesh, Dadra & Nagar Haveli, Maharashtra

Update on the Master Plan Appraisal

	Group A	Group B	Group C	Group D
	Sh. S. C. Sharma Prof. (Dr.) M. Shaheer Dr. Brij Kishor Gupta	Sh. S. K. Patnaik Prof.) Rommel Mehta Sh. Kartick Satyanarayan	Sh. R. S. Bhadauria Prof. Surinder Suneja Sh. Himanshu Malhotra	Sh. A. S. Dogra Chief Engineer, CCU, MoEF Dr. A. K. Malhotra
Name of the State	Andhra Pradesh; Kerala, Karnataka, Tamil Nadu	Uttar Pradesh, Gujarat, Uttarakhand, Jammu & Kashmir, Haryana, Bihar, Chhattisgarh, Jharkhand, Delhi, Punjab	Arunachal Pradesh, Assam, Mizoram, Sikkim, Meghalaya, Tripura, West Bengal, Orissa, Nagaland, Manipur	Rajasthan, Goa, Madhya Pradesh, Andaman & Nicobar Islands, Himachal Pradesh, Dadra & Nagar Haveli, Maharashtra
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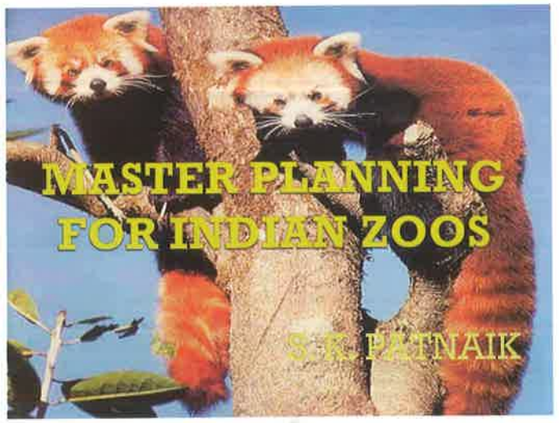
Master Planning in Indian Zoos I & II

- by SK Patnaik

Mr. S. K. Patnaik, in his presentation "Master planning in Indian zoos-I&II" gave an idea in preparing master plan & what priorities are to be consider in preparing master plan.



ZOO MASTER PLAN

The Master Plan is a comprehensive document to guide systematic and planned development of an existing or a new zoo for a reasonably long period of 10-20 years keeping its land, financial, personnel, physical and aesthetic resources and constraints in view in order to provide holistic nature conservation education with wholesome recreation. This document helps in optimum utilization of the zoo resources in a planned manner, without being affected by individual whims, peer or uninformed public opinion and serves as a document to guide annual budgeting and personnel planning.



Master Plan of a zoo should be a comprehensive document giving a detailed road map for the plan period regarding development, improvement and up gradation of the facilities and infrastructure available at the zoo and building up of the capacity for carrying out all the operations forming part of the zoo management with greater efficiency.


How to Prepare a Master Plan?

- In- House Consultation with:
  - Present Senior Zoo Staff
  - Former Senior Zoo Staff
  - Biologists (From Universities etc.)
  - Architects and Landscape planners
  - State or local Leadership
  - Visitors (through documentation of their perception)
  - Veterinarians
  - Other Stakeholders
- Consultations to be facilitated by outside consultants, if required
- Through External Consultants :
  - When it is a new Zoo
  - When local/in-house expertise is not available
- Consultants can be provided with different inputs by the zoo management including contour map of appropriate scale to make their efforts easier.

It shall involve following steps:

1) Defining mission, vision and conservation message
2) Inventorize and evaluate present infrastructural facilities, resources available and shortcomings
3) Identification of priority needs
4) Developing implementable action plan with estimated cost
5) Based on above prepare a **concept plan** for approval

Priority Areas:

1) Achieve high standard of housing and upkeep
2) Planned breeding of endangered species (off exhibit)
3) Availability of expertise on health care and suitability of climatic condition
4) Thematic display in nature immersing exhibits
5) Assess carrying capacity of visitors
6) Planning smooth visitor circulation
7) Proper signage/interpretation
8) Waste disposal system (garbage and liquid waste)
9) Public facilities and civic amenities
10) Management of natural disasters and contingencies

Before drafting the master plan it is of utmost importance and crucial to set goal for the zoo. by the end of the plan period and planning shall follow keeping that goal in mind

- **What will be the theme**
  - **Eco system approach (Nilgiris, desert & wetland , riverine, high altitude etc)**
  - **Zoo/bio-geographic approach (region, country or continent)**
  - **Taxonomic approach (family, class or order)**
  - **Behavioral approach (nocturnal, aquatic, burrowing arboreal etc)**
  - **Any other type of approach like mythological etc**
  - **Paranoiac disposition etc (mixture of all the above)**
- **Conservation breeding centre**
- **Amusement park**
- **Safari Park**
- **Nature Education centre etc.**

Master Plan

Part – I – Existing Situation

- Location and Approach
- Topography
- Vegetation
- Legal Status
- History of Zoo or Site
- Water & Power Source
- Existing Structure & Facilities
- Garbage disposal
- Visitation
- Facilities in different Sections and their management
- Visitor amenities
- Visitor education and research
- Landscaping
- Any other aspects needing highlighting

Part - II – Planning

- Master Layout and Plan
- Animal Collection Plan
- Proposed Development – Unit wise:
  - Administrative Pattern
  - Animal Section
  - Veterinary Section
  - Lawns & Gardens
  - Internal Roads
  - Stores
  - Maintenance Section
  - Revenue Section
  - Research
  - Education

Part - II – Planning (contd...)

- Tourist Amenities
- Water Supply
- Sanitation including disposal of Solid & Liquid Waste
- Power Supply
- Other Sections
- Personnel planning
- Contingency plan
- Disaster management
- E-governance
- Any other aspect peculiar to the zoo

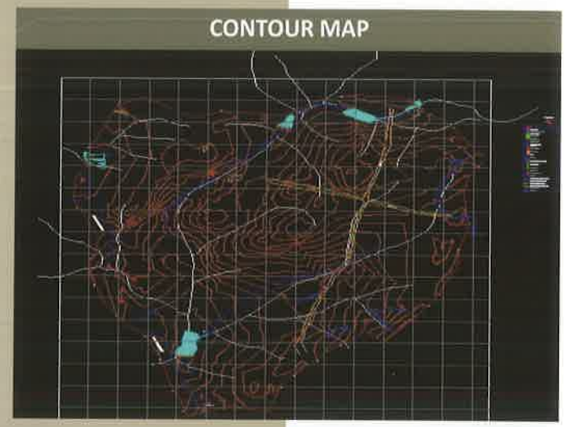
Master Layout Plan

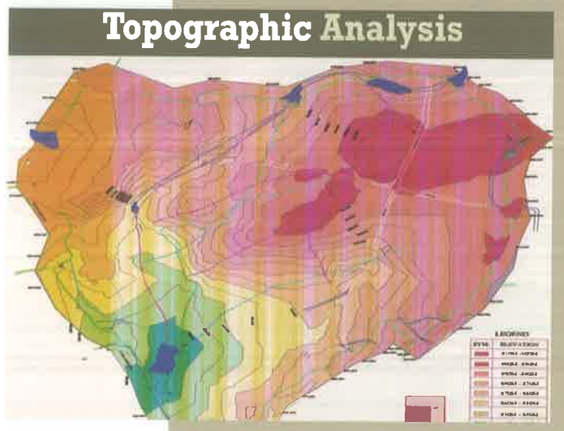
- Scale-1:1,000 to 1:5,000
- Contour interval-1m to 5m. as per topography
- Show features (water bodies, forest patches, precipices, structures and ruins, rocks, visitor circulation, amenities, drainage, water and power supply lines, solid and liquid waste disposal, entrance, approach, colony, parking lot, administrative building , veterinary hospital, feed store carcass disposal area, surrounding area and topography etc.)

Master Layout Plan (contd...)

- Existing zoo can show existing enclosures to be retained (black), to be modified(green) to be demolished and redone (red) and new structures (blue)
- Scale ,contour interval, contour lines and north direction to be indicated in the plan

- Layout plan should show clearly in the following manner:
- Existing enclosures to be retained – Black
- Existing enclosures to be modified – Green
- Existing enclosures to be demolished and redone – Red
- New enclosures to be constructed – Blue
- Structures other than enclosures can also be given similar colours when retained modified demolished or new.
- Power lines, sewerage lines, visitor circulation, service paths and water supply lines should be nearly shown in the layout plan





Collection Plan

Collection Plan, is a plan, listing animals and their numbers, which the zoo intend to procure and house in the zoo based on carrying capacity, which will be determined by availability of enclosure space, capability of zoo personnel (keepers)to handle them and ability of the zoo to support the number with ease etc. While doing so, care should be taken to see that smaller number of species in large social groups are planned to be kept.

Collection Plan (contd...)

Priority should be given to the locally occurring species and those, which are from similar climatic conditions. This collection plan should keep in mind the space, facility and expertise with the zoo, and species which can be procured from other zoos of the country or abroad without difficulty and can be maintained by the zoo without difficulty.

Collection Plan (contd...)

Species	Present stock				Proposed collection				To be procured (+) Removed(-)				Remarks
	M	F	US	Total	M	F	US	Total	M	F	US	Total	
Birds													
Reptiles													
Others													

The collection plan should be in tabular form indicating present number of each species with sex, number proposed to be kept with sex and animals proposed to be procured.

There should be arrangement of review its functioning and course correction, if required periodically, may be every 5 years.

Random Thoughts on Master Planning

- by SC Sharma

The presentation of Mr. S.C. Sharma was focused on core values of planning, definition of planning, key to success of master plan and gave suggestions for consideration of Indian zoos.

MASTER PLANNING IN DAILY LIFE

WORLD IS CONSTANTLY CHANGING & NEW PROBLEMS & CHALLENGES EMERGING

DEAL WITH THEM AS AND WHEN THEY ARISE

CAUGHT UNAWARE,CHANCES OF SUCCESS LIMITED

CRISIS & CONFUSION

FORESEE THEM, & PLAN TO MITIGATE & PREEMPT.

EVALUATE STRENGTH & WEAKNESS TO DO SO.

ENHANCE YOUR CAPABILITY

ACCOMPLISH THE MISSION

SATISFACTION & SENSE OF ACHIEVEMENT

HAPPINESS & PROSPERITY

HOW TO GET IT

- LIVEING PLACE & COMFORTS
- COMPATABLE & CHARMING LIFE PARTNER
- SMART & WELL TO DO CHILDREN
- SENSE OF FULFILMMENT & ACHIEVEMENT
- OLD AGE SECURITY
- SOCIAL RECOGNITION

HONESTY
INTEGRITY
HARDWORK
PERSEVERANCE

GOOD JOB
OR
SUCCESSFUL BUSINESS

APPROPAITE PLANNING CAPABILITY

SETUP MILE STONES

ACCOMPLISH THEM WITHIN AVAILABLE RSOURCES

PRIORTIZE & IMPLEMENT

SATISFACTION

- WE MUST STRIVE TO MAKE TODAY A LITTLE BETTER THAN YESTERDAY, SO THAT WE CAN ENJOY TOMORROW.

BURNING ENVIRONMENTAL ISSUS

* EMERGENT NEED TO REVRESE THE ONGOING TREND OF ENVIRONMENTAL DEGRADTION
* SAVE THE MAN KIND FROM THE HAZARDS OF CLIMATE CHANGE AND OZONE DEPLETION
* SAFEGUARD AGAINST THE VAGARIES OF DROUGHT,FLOOD

VISIONS & MISSIONS OF SOME IMPORTANT ZOOS

* **CINCINATI ZOO**

VISION : ***INSPIRING PASSION FOR NATURE & SAVING WILD LIFE FOR FUTURE.***

MISSIONS:

1. CONVEYING KNOWLEDGE
2. CONSERVING NATURE
3. PROMOTING ADVENTURE
4. SERVING THE COMMUNITY

* **DENEVER ZOO**
* **VISION :** A DIRECTION FOR TODAY, PROMISE FOR TOMORROW

MISSIONS:

1. SECURE A BETTER WORLD FOR ANIMALS THROUGH HUMAN UNDERSTANDING

ATLANTA ZOO

VISION: A WORLD IN WHICH HUMAN KIND VALUES , PROTECTS & PRESERVES THE DIVERSITY OF SPECIES ON EARTH.

MISSION:

INSPIRE THE CITIZENS TO VALUE WILD LIFE ON EARTH & SAFE GUARD EXTINCTING SPECIES THROUGH CONSERVATION.

PERTH ZOO

VISION: A WORLD WHERE OF DIVERSITY OF SPECIES & HABITATS IS SECURE.

MISSIONS:

TO SECURE LONG TERM POPULATION OF SPECIES IN NATUARAL ENVIRONMENTS, WHILE ENGAGING THE COMMUNITY IN GLOBAL CONSERVATION ACTION.

DEFINATIONS

VISION :

HOW THE ORGANIZATION WOULD LIKE TO SEE THE WORLD IN FUTURE IN IT'S AREA OF INFLUENCE.

MISSION

HOW THE ORGANIZTION PROPOSES TO CONTRIBUTE TO REALIZATION OF THE VISION

CONTD....

DEFINATIONS

MASTER PLAN

* ROAD MAP OF STRATEGIES AND ACTIVITIES TO ACHIEVE THE SPECIFIED VISION & MISSIONS IN A GIVEN TIME FRAME.
* WHAT DO WE DO, FOR WHOM & HOW TO ENSURE THAT WE EXCEL IN WHAT WE DO.

KEY TO SUCCESS OF MASTER PLAN

FIRM CONVICTION & COMMITMENT To THE ADOPTED VISION & MISSION
KEEN DESIRE TO EXCEL AND STAND OUT A S AGOOD ZOO
ADMINSTRATIVE MECHANISM TO ENSURE CONTINUITY OF POLICIES
FEET FIRMLY ON GROUND
OPENMINDED & IMAGINATIVE ATTITUDE, WILLINGNESS TO CHANGE

AUTHORISATION & ACCOUNTABLITY
1. TOP MANAGEMENT ..... POLICY REVIEW & IMPROVEMENT
2. MIDDLE MANAGEMENT... EFFORT TO IMPROVE & REDRSS BOTTLENECKS
3. BOTTOM MANAGEMENT.. EXECUTION & MAINTENANCE

CORE VALUES

* CONSERVE & PROTECT LOCAL PHYSICAL ENVIRONMENT
* ZERO IMPACT ON NATURAL RESOURCES.
* HIGHEST STANDARDS OF ANIMAL WELFARE
* SAFE/ CONDUCIVE WORKING ENVIRONMENT FOR FIELD STAFF
* COURTEOUS AND RESPONSIVE BEHAVIOUR TO VISTORS
* INVITE PARTICIPATION FROM LOCAL COMMUNITIES/ BODYS

MASTER PLANNING - CURENT TRENDS

* DEMOLISH OBSOLETE AND CRAMPED EXHIBITS
* CREATE IN-SITU STIMULATING HABITATS THAT FOSTER PHYSICAL& PSYCHOLOGICAL NEEDS OF ANIMALS
* IMAGINATIVE SIGNAGE & GRAPHICS TO COMMUNICATE PERCIEVABLE / IMPLEMENTABLE CONSERVATION MESSAGE
* SELF SUSTANING POPULATIONS OF GENETICALLY & BEHAVIOURALLY SOUND ANIMALS
* PROVIDE ZOO VISITORS INSIGHT IN TO NATURE

CONTD...

MASTER PLANNING - CURENT TRENDS

TORONTO ZOO

- AUSTALASIA PAVALION PHASED OUT AND GREAT BARRIER REEF EXHIBIT CREATED
- POLAR BEER,LLAMA, DALLA'S SHEEP & MARA EXIBITS REPLACED BY TUNDRA TREK

DENEVER ZOO

- CORE ZOO EXHIBT AREA DEMOLSHED. PRIMATE PANORAMA AND TROPICAL DISCOVERY EXHIBITS CONSTRUCTED.
- BRONX ZOO-CONGO REGION EXHIBIT CREATED
- ZURICH –MASOLA REGION RAIN FOREST EXIBIT

WORDS OF WISDOM FROM EMINENT ZOO MEN

MOST BASIC FEATURE OF NATURALISTIC EXHIBITERY

- EXPOSURE OF ANIMALS TO FRESH AIR,NATURAL SUNLIGHT,ASOFT SUBSTRATE,SUCH AS GRASS AND DIRT AND BUSHES FOR CLIMBING,LEANING,FORAGING, NESTING AND VISUAL COVER (HUTCHINS ET.AL1984).
- THE EXHIBITION OF SPECIES SPECIFIC BEHAVIOUR SHOULD BE THE GOAL OF ZOO HUSBANDARY PRPGRAME.THERE ARE, HOWEVER,LIMITATIONS ON THE EXTENT TO WHICH THIS CAN BE ACHIEVED (MAPLE ET,AL).

CONTD...

WORDS OF WISDOM FROM EMINENT ZOO MEN

- IT IS CRITICAL THAT THE ZOO MANAGERS BE PERCIEVED AS CARING,COMPASSIONATE INDIVIDUAL WITHREGARD TO ANIMAL ISSUES,AS WE ENDEAVOUR TO ENGAGE THE PUBLIC IN ACTIVE PARTNERSHIP TO ACHIEVE OUR MUTUAL CONSERVATION GOAL(MAPLE ET.AL).
- DO NOT TRY THE IMPOSSIBLE,THAT IS TO KEEP THE ANIMALS IN TOTALLY UNSUITBLE CLIMATE(JACOBI).
- STUDY THE PUBLIC, THEN LEAD THEM - DON'T BE LEAD BY THEM.FOLLOWIG THE VISITORS SLAVISHLY RESULTS IN A RESTRICTED & ORDINRY SERIES OF EXHIBITS(PAINGTON WORKSHOP -1976).

CONTD...

WORDS OF WISDOM FROM EMINENT ZOO MEN

- KNOWLEDGE IS THE ESSENTIAL PREREQUISITE TO MAKING A DECISION RESPECTING A SPECIES,POPULATION OR GROUP OF WILD LIFE.A DECISION MADE IN ABSENCE OF INFORMATION ABOUT A SPECIES OR POPULATION,DEPENDIG ON THE RESULT,IS AT WORST AN ACT OF IGNORANCE,OR,AT BEST ASTOKE OF LUCK(POOLE ET .AL).

CONTD...

WORDS OF WISDOM FROM EMINENT ZOO MEN

- ALLOW THE ANIMALS TO GO IN AND OUT OF THEIR FRONT EXHIBITION AND THEIR BACK SECLUDED QUARTERS AS THEY PLEASE (PAIGNTON CONF.)
- STOP SHOWING THE ANIMALS BEHIND THE BARS AND WIRE.CREATE A PLACE VIEWER IS NOT THE OWNER BUT AHUMBLE GUEST. THE VISITOR WILL HAVE TO WAIT FOR THE ANIMAL TO APPEAR AND MEAN WHILE THE ANIMAL WILL HAVE THE SAME FREEDOM THAT IT HAD IN THE WILD (PAIGNTON CONF.)

PLAY SMART & EXCEL IN ALL ASPECTS OF ZOO MANAGEMENT

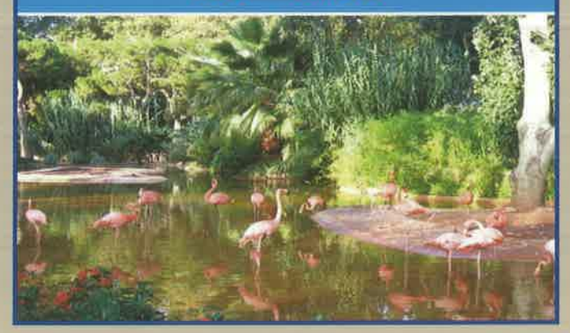
SET UP GOALS IN THE MASTER PLAN WHICH ARE:

- SPECIFIC
- MEASURABLE
- ACTIONABLE
- REALISTIC
- TIME BOUND

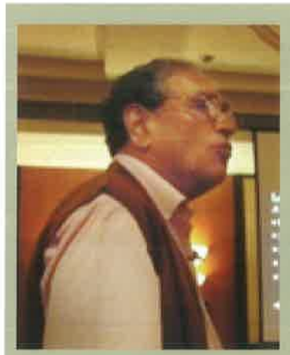
SUGGESTIONS FOR CONSIDERATION OF INDIAN ZOOS

- MAKE YOUR ZOO OUTSTANDING BUT EXCLUSIVE.
- SHIFT FOCUS FROM THE NUMBER OF SPECIES DISPLAYED TO LANDSCAPE/ HABITAT SIMULATING EXIBITS.
- THEMATIC LAYOUT OF EXIHIBITS TO ENLIGHTEN VISITORS ABOUT CONSERVATION LINKAGES.
- NATUR EMERSING ENVIRONMENT FREE OF MASSIVE CEMENT CONCRETE STRUCTURES.
- HIGE QUALITY / NATURE FRIENDLY VISITOR EMINITIES

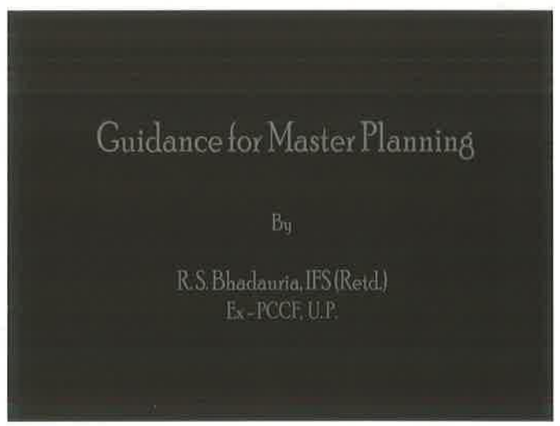
ZOO VISION

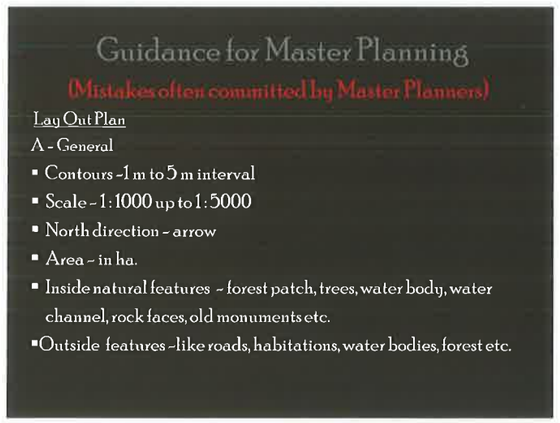


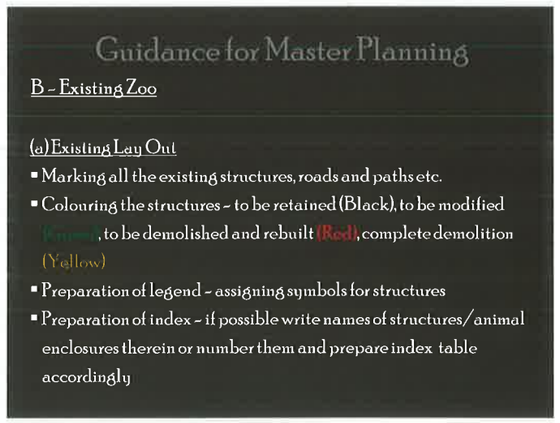
Guidance for Master Planning in Zoos - by RS Badauria



The presentation of Mr. R. S. Bhadauria "Guidance for master planning of zoos" gave information on guide lines for master plan preparation with details of budget analysis, layout plans and collection plan.







Guidance for Master Planning

(b) Revised Lay Out Plan

- Marking revised & planned structures, roads and paths etc.
- Colouring the structures – Retained (Black), to be modified (Green), to be demolished (Red), to be added new
- Preparation of legend – assigning symbols for structures
- Preparation of index – if possible write names of structures/animal enclosures therein or number them and prepare index table accordingly

Guidance for Master Planning

C – New Zoo

- Marking all the proposed structures (as explained in the lectures on Master planning)
- Marking all structures (except existing) in Blue colour
- Preparation of legend – assigning symbols for structures
- Preparation of index – if possible write names of structures/animal enclosures therein or number them and prepare index table accordingly

Guidance for Master Planning

Master Plan – Write Up

- Follow the format prescribed by CZA
- Prepare Table of Contents or Index in the beginning with page nos. to facilitate referencing

Part – I

- Introduction – as per format
- Appraisal – in case of existing zoo, appraise existing arrangement and constraints as per format
- Identified constraints – need to be redressed in future planning & staffing and included in budget proposals
- In case of new zoo – appraise potential and attributes of new site

Guidance for Master Planning

Collection Plan

- Justification for intended collection
- Show first the existing stock and thereafter the proposed stock in tabular form indicating the name of spp., number with sex ratio, classifying them under broad categories – Mammals, Birds, Reptiles, and Amphibians etc.
- No unpaired animal to be kept

Guidance for Master Planning

Part-II

- Personnel Planning – quantify present staff, identify inadequacy if any and propose additional staff with justification
- Show both present and proposed staff in hierarchical order splitting in to sections like; Admin. section, Feed & distribution, Sanitation, Security, Maintenance, Education & research sections etc.
- Norms for Director, Curator and Vet. officer
- Most important sections are animal care and veterinary sections

Guidance for Master Planning

Budget Analysis

- Prepare separate tables for non-recurring and recurring, item – wise and year-wise estimated expenditure
- All items of capital works proposed for future development in the write up of the plan should be reflected in budget proposal
- Recurring expdt. should reflect all items of maintenance like; Salary, T.A., Vehicle maint./running, Office expdt., Animal feed, Treatment/ Medicine , Sanitation, Education/Awareness and Misc.expenditure

Thank You!

Concluding Session

Concluding session in progress

Momentoes to the Resource persons

Concluding Session

The Concluding session stared after the Groups presented their recommendations, on the Day 4. In this session, many spoke positively, informally and from the bottom of their heart. In general, the Workshop was a success and it was receiced very well by the new and regular participants. There was a fair amout of sharing experiences for seniors and as well as learning for many.
A brief account of feeling of a few is included here.

Praveen Chandra Tyagi, IFS, Prof. Wildlife Institute of India
Dr Brij Kishore Gupta is to present the sum up of four day workshop proceedings.
This is the most exciting workshop I attended. Jon and Roger finalized the exhibit designs finally, so that we can implement. Exhibit should have story line, theme. Management style should be related to design. We should create complexity to create enrichment in the enclosure.

We should develop vegetation, check soil water and security. Hiding barriers can be achieved by immersion barriers. Provide a discrete view, simulate the animal in the nature. Six groups worked hard yesterday and gave suggestions. We had 35 directors from different zoos of India, 17 arrived today, CZA staff members, Member sec, WII, School of architecture from Delhi.

All the zoo directors were benefitted by the speeches of Jon and Sherman.
We had different Directors' speeches. We went to LaCONES, we visited NZP, IZDA meeting and Golconda.
Today the fourth day, 17 directors arrived got a great experience in the zoo management.

SK Patnaik, IFS, Former Chief Wildlife Warden, Odisha
The areas discussed were about masterplan, conservation breeding, zoo management, educational programs and support from other organisations. This work shop must have been very much supportive to the NZP as we were divided into different groups to make suggestions regarding the enrichment and uplift of the zoo.

BS Bonal, IFS, Member Secretary, CZA
Infact, I am very much thrilled, when I attended this earlier, I was Director of a Zoo. Gupta has already narrated everything. CZA is the organisation with one Member Secretary, evaluation offic-

ers, education officers and other members. It is very difficult to organize. Fortunately it is finalized in cabinet to appoint DIG. Four regional offices will be opened, one each in Hyderabad, Nagpur, Guwahati amd Jaipur. DIG will be incharge of the regional centers. Apart from that in the 12th 5 year plan, to develop eco-tourism which has been given to MoEF and I am one of the members of it. In Indian context, Zoos are not for commercial purpose. To avoid the overlapping the fund received from eco tourism will be utilized for interpretation center, boating and other ecotourism related aspects without affecting the wildlife. CZA is going o launch newsletters for which Directors are asked to give photos and write-ups for the publication purpose.

We had a MP session also. This is going to the top of the Directors that to provide immersion enclosure, enrichment, naturalistic enclosures and I am sure that when directors go back, they start working on this. I would also request Zoo Directors to mark the animals, which is very important; we will be sending the markers. Especially for the animals identified for CB.

Please submit the proposal as per the format given by CZA along with the information. Once we receive that we have no problem in approving. With this I would like to sum up that the master plan which is in the process. Master planning process is difficult. Im sure that they will be cleared and submitted soon. We are very much thankful to Jon Coe and

Roger Sherman who attended this workshop despite busy schedules. And I must thank WII for the guidelines prepared, although CZA has prepared some guidelines, they are in process of preparation, we thank WII for contributing the guidelines for transport of animals etc. this guideline for the landscape will be prepared and will be circulated amongst the members and the members distribute to the directors of all Indian Zoos. We thank the hosts for keeping every one engaged in this rather spending time in markets.
I ask all to remember all the guidelines, save energy, save water, save wildlife.

Jon Coe, Australia
I spent time in many zoos of many countries. The reason for travelling all the way long is to give suggestions regarding the design, we really had a great time. Hyderabad zoo is very good.

SC Sharma, IFS (Retd), CZA
Im really grateful to CZA and organizers to give me a chance to speak. As far as Hyderabad or AP is concerned, AP has contributed a lot to CZA. Land of LaCONES was contributed by AP Forest Deptt. CZA should not be considered as blockers, they are facilitators. Each of the Director

should follow the guidelines. I can see the faces who did an outstanding work, they should guide the younger generation. We should take advantage of the knowledge spreaded by the experienced persons.

Amitabh Agnihotri, IFS, Director, National Zoological Park, New Delhi
I was just sitting there, if I was not called, I thought of coming in the end to propose the vote of thanks. I came to say few words. The first workshop I attended was in 1996 in Mumbai. This workshop lived up to my satisfaction. Guidelines are very much useful, these gave me a very good knowledge. When I was in Van Vihar, I got made a tiger enclosure of a tiger as big as 50 ha, which is too much, after attending the workshop I came to know the optimum conditions of the tiger enclosure. I would also thank Mr. Waheed and his team for the pleasant stay in the hotel and in Hyderabad.
Thank you so much.

Valedictory Function

After the concluding remarks, the workshop proceedings came to an end. Certificate were distributed thereafter, to all the participants. And the resource people were honoured by giving gifts.

Momentoes and Certificate Distribution in progress

Certificate Distribution in progress

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Group Photo